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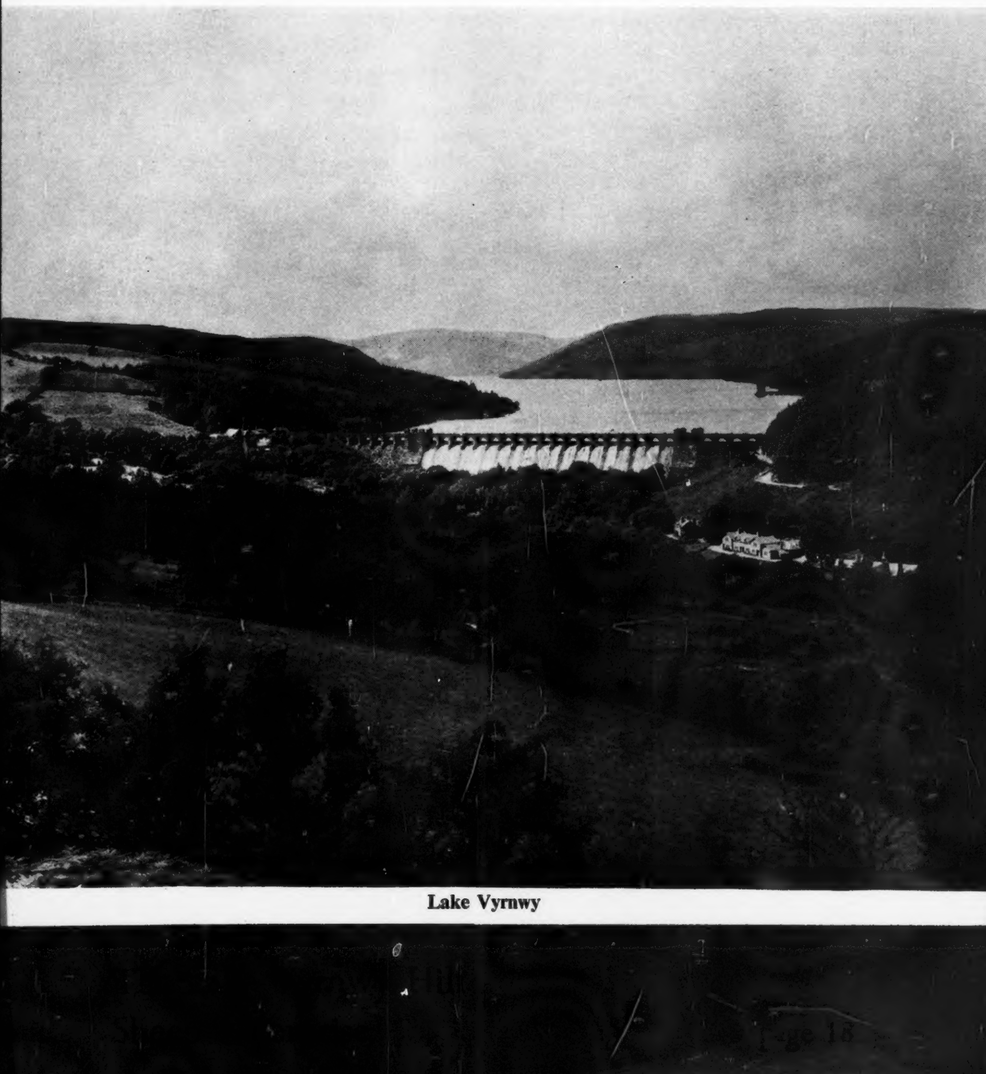

Lake Vyrnwy

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The Larger Dairy Herd

John D. Foster of the Agricultural Land Service discusses the problems of this important subject which has been examined at a recent conference organized by the Ministry's advisory services.

OF all agricultural subjects, dairy farming for many years past has provided the most fertile field for argument and discussion. There were traditionalists who maintained their preference for the dairy Shorthorn in face of the all conquering Friesian—and that's 'fightin' talk' still in many quarters! The parlour versus cowshed controversy led later to the dogmatic assertion by some experts that no parlour was any good unless it was a herringbone. Strawyards gave way to slats which in turn were quickly discredited in favour of cubicles; and now the kennel is à la mode for 1967.

The future

But look to the future, and for the innovators amongst our agriculturists look now, it is cowtels, rotor lactors and cows by their hundreds. For the Jones's themselves, with whom all the rest of us merely try to keep pace, it is cows by the thousand.

It is for this reason no doubt that a recent conference organized by the Ministry's advisory services in the South-East was well attended and produced a lively discussion following three first-class papers. The speakers did not, of course, provide any cut and dried answers. Indeed the many questioners who expected instant answers to their individual problems were predictably disappointed. But the problems in general were well examined and some broad principles emerged. The first to speak was a farm manager in charge of an eighteen hundred acre farm whereon he had in the past few years increased the dairy cows from one hundred to two hundred and twenty. His was the practical report of an obviously practical man. The increase in his dairy herd had been achieved by adding to existing buildings and installing a ten-unit twenty-stall herringbone parlour. The three cowmen who had struggled in the past with one hundred cows now made an ideal team earning more money in less hours with two hundred. This number, perhaps up to two hundred and fifty, was the ideal and could be well cared for if the head cowman had a farm institute training, and was capable of earning £25 to £30 a week. Three men ensured that two of the regulars were always there to operate five units apiece in the parlour.

To help them, of course, proper records were needed to check on milk yield, calving index, cows due for service and so on. But the herd could be kept on the traditional system. They could go out in the summer for paddock grazing though the problem of poaching must be anticipated and preventive measures taken. Five hundred cows? The speaker thought not. A herd

manager—almost a non-producer!—would be needed. The traditional system of letting cows out to grass would present too many, insuperable problems. And slurry, just manageable using three handling systems with his two hundred plus herd, might well sink a five hundred cow enterprise without trace.

Next to speak was a buildings expert from the Agricultural Land Service. He dealt with both the economic aspect and the technical aspect. Rightly, because the important design elements are still incredibly so little known, he covered the various environmental and operational requirements of any good dairy layout. He discussed the scale of enterprise which was selling two thousand gallons of milk a day, pointing out that this meant ten tons of milk at the front door, and some thirty tons of slurry at the back door. With a further ten tons of dry matter being fed there is a materials handling problem in the region of fifty tons per day. In addition, whilst a good cowman might be able to remember four hundred individual cows when he saw the whole animal, the rear end profile presented to him in the milking pit was less easily recognized. Electronic recognition devices, auger feed systems, tower silos, the repercussions of a revival in the popularity of grass drying or of a change to arable silage were discussed. Mechanical ventilation and the use of heat exchange units and the added need to study cow behaviour when they are assembled in their hundreds were other points dealt with.

Economic size of herd

But the speaker set out no model plan for the large dairy set up. It was clear that this was exploration rather than explanation and the casual reference on occasion to herds of between one and eight thousand cows emphasized the fact that, before getting down to brass tacks in designing buildings, it was the farmer's task to decide what was economic and determine the size of the cow unit.

Could the final speaker, an economist, give firm advice on this? His researches gave the lie to the popular assumption that the small herd given individual attention produces better milk yields and higher stocking rates. It was, on the contrary, noteworthy that the highest stocking rates were achieved with herds of one hundred cows and more and this group had 5 per cent higher milk yields and used 18 per cent less concentrates than the average. On labour saving it was pointed out that economies achieved by dairy farmers have come from a change in milking equipment and new buildings rather than from increased herd size. All-in-all the economist decided that given expert labour and the benefit of the help of labour saving devices the herd of up to one hundred and fifty cows was one which could advantageously be achieved and managed by traditional methods. Beyond this he felt there was a good deal of work to be done by pioneers before the common, hard headed, 'can't afford costly mistakes', British farmer should risk the multi-hundred cow dairy unit. There is no doubt that to follow the fortunes of these pioneers will be a fascinating study.

Before the war, **John D. Foster, B.Sc.(E.M.), A.R.I.C.S., F.A.I.,** was an agricultural auctioneer and land agent in Worcestershire. He went into the Army in 1939 and was subsequently seconded to the R.A.F. as a pilot. He later became Deputy Executive Officer of the Cumberland W.A.E.C. and, after three years, joined the Ministry's Agricultural Land Service. Since 1957 he has been Land Commissioner for Worcestershire, Warwickshire and Herefordshire.

Disease Resistance in Cereal Growing

D. A. Doling

IN the Middle Ages cereal yields were about 5 cwt per acre. But after the introduction of leguminous crops in the 18th Century, yields rose considerably and are now often more than 50 cwt per acre. The national average yield is about half this figure and indicates the influence of bad weather, pests and diseases. The system of crop rotation generally followed during the last one hundred years has maintained a high fertility level, given good control of weeds and avoided or minimized the effects of pests and diseases in the crops. Economic pressures of recent years have encouraged shorter rotations with a greater proportion of cereal crops. This has been possible because readily available synthetic fertilizers and cheap selective weed-killers have replaced two of the functions of rotation. But the control of pests and diseases in cereals remains largely unsolved and continues to be a matter of considerable concern in crops under intensive systems of management.

Four factors influence disease

The weather plays a prominent part in influencing the severity of plant diseases. The geographical position of the British Isles ensures such a variety of climatic conditions in successive years that any one disease is prevented from becoming the dominant factor in crop cultivation or crop improvement. Crop hygiene helps in controlling diseases under all systems of management, but intensive cereal growing, particularly continuous cropping, calls for a high standard of field hygiene and demands considerable skill in the management of cultivations and their timing throughout the year.

Chemical control of cereal diseases is at present limited to seed treatments as it is impracticable to apply fungicides to growing crops at regular intervals throughout the season. Newly discovered fungicides with systemic properties may soon change this situation, although it is generally felt nowadays that control by methods other than chemical are preferable whenever possible.

The development and use of disease and pest resistant varieties can also contribute to the production of healthy crops and good quality grain.

Still a young science

The systematic improvement of crop plants by breeding began only about sixty years ago. At the very outset of the work in Britain, Sir Roland Biffen discovered that disease resistance was an inheritable character which could

Plots of wheat varieties susceptible (left) and resistant (right) to powdery mildew

be included in plant breeding programmes. The production of better varieties by various techniques throughout the world, nowadays includes disease resistance as a matter of course. The measure of success achieved so far, particularly in the foliar diseases, can readily be seen when plots of the older and newer varieties are grown alongside one another. Even varieties such as Proctor barley, Hybrid 46 wheat and Condor oats, which are usually infected with powdery mildew to some extent each year and are at present regarded as susceptible varieties, show a considerable measure of resistance to the disease when compared with many of the older varieties. But many newer varieties like Sultan, Mildress and Padarn show a much higher level of mildew resistance.

One of the major complications in breeding for disease resistance arises because of the genetic variability of the pathogens. Every fungus is able to develop new forms (physiologic races) often possessing a wide range of virulence which can overcome the resistance incorporated into new varieties by plant breeding. Such a phenomenon is well known in foliar diseases, and in particular, the yellow rust and mildew fungi have demonstrated their ability to produce new physiologic races which have increased to serious epidemic proportions in a very short time.

Yellow rust epidemics prevented

An examination of data from spring and winter wheat trials conducted by the National Institute of Agricultural Botany since 1956 shows that in 7 of the 12 years there has been moderate or severe yellow rust on susceptible varieties. This suggests that weather conditions have favoured the development of severe yellow rust epidemics in half of the years of the last decade. The question naturally arises as to why the disease was not economically important in commercial crops in these years. During this period the winter

wheat variety, Cappelle-Desprez, accounted for about 80 per cent of the wheat acreage. This variety, whilst not immune to yellow rust, has a high level of resistance to the physiologic races then occurring. The conclusion must be that its resistance was sufficient to prevent yellow rust from developing to severe proportions in commercial crops despite the favourable weather.

The sporadic appearance of this disease makes difficult any estimates of the average loss to the farmer due to yellow rust. But reference to specific varieties in particular years can indicate the potential yield losses to be expected. Losses of 50 per cent or more commonly occurred in Rothwell Perdix, both in 1966 and in 1967 but the mean loss for nine susceptible varieties in N.I.A.B. cereal trials over 11 years was 12 per cent.

The resistance of Capelle-Desprez has not only avoided such severe losses due to yellow rust but has also reduced the frequency of severe epidemics enabling other varieties, particularly susceptible spring wheat varieties, to escape infection by the fungus. Disease resistance in a variety not only assists in producing its full potential yield, but also helps to achieve this regularly each year despite disease epidemics. The regular supply of a good quality product provides an ideal marketing situation.

Clearly recent experience has shown that plant breeders and others who aim to select varieties of value to the farmer must consider the desirability of the kind of resistance possessed by Capelle-Desprez in contrast to that to be found in varieties such as Rothwell Perdix, or in the much older sister variety of Cappelle, Nord Desprez. Both Nord Desprez and Rothwell Perdix exhibited a very high level of disease resistance during trials amounting to immunity to the disease. But the variability of the fungus permitted it to develop a new physiologic race on each occasion to meet and overcome the challenge of the resistance in each variety.

It is easy to say that the kind of resistance shown by Cappelle-Desprez is desirable for all new varieties but at present it seems to be difficult to obtain. The nature of this resistance is entirely unknown and practicable methods for use as a basis for selecting potentially valuable breeding material or assessing the relative merits of new varieties are so far very rudimentary.

Barley mildew important

Another foliage disease which has received a great deal of attention by plant breeders is powdery mildew. This disease is of considerable importance as it occurs throughout the country almost every year at levels sufficient to depress yields significantly. Experiments and trials throughout the country during the last 10 years indicate that the average loss of spring barley due to mildew is 7 per cent or 2 cwt from a 30 cwt crop and, of course, losses in years of severe mildew are very much higher.

Crops with half their foliage covered with mildew can be expected to suffer a 20 per cent yield loss—4 cwt of every ton expected from the crop. These are losses based on experiments with Proctor but, as already mentioned, the actual losses would be very much greater if plant breeding had not progressed sufficiently to incorporate the kind of resistance which even Proctor has. More modern varieties such as Zephyr, Deba Abed, and Impala, whilst showing more mildew infection than when first introduced because of the development of new physiologic races, are still less infected than the older varieties like Proctor and Rika. It is to be expected, therefore,

Powdery mildew in barley crops is responsible for losses of 2 cwt per acre on average every year

that not only will they yield more in the absence of mildew but that they will also give better yields when mildew is present.

With the introduction of mildew resistant varieties into commerce other foliar diseases have become increasingly noticeable. *Rhynchosporium* leaf blotch was serious on nearly all two-row barley varieties but was fortunately limited to coastal or misty inland areas in 1964 and 1965. Only the six-row winter varieties are resistant to this disease and choice of variety amongst the two-row varieties cannot help very much in combating it, although Proctor is better than most others. More recently yellow rust and brown rust have increased on barley and again there is little help to be derived from any resistance in current barley varieties. However, the possibility of these diseases increasing in importance was realized some years ago and many plant breeders have included resistance to these diseases in their lists of desirable characters. It should not be long, therefore, before suitable resistant varieties are available.

Resistance for soil diseases

The problem of new physiologic races does not seem to arise so readily in fungi causing root and stem diseases, probably because it is relatively difficult for the new physiologic race to multiply and spread quickly over a wide area. Obviously spores produced on leaves can easily be spread by wind and multiply on suitable hosts but movements of a fungus naturally inhabiting soil is much more restricted. For this reason perhaps Cappelle-Desprez has maintained its eyespot resistance at a very high level. Dr. Mary Glynne of Rothamsted found in 1953, the year in which Cappelle-Desprez was recommended by the N.I.A.B., that about one wheat crop in three suffered severely from eyespot on the heavier land when grown in a four course rotation in

East Anglia and one in two suffered in the wetter North of England. She also found that over a nineteen year period losses due to eyespot in the variety Yeoman amounted to 12 per cent per year or about 3½ cwt per acre in a 30 cwt crop.

The dominating position of Cappelle-Desprez since 1953 has certainly reduced the prevalence of eyespot but to what extent is not known as no recent surveys have been undertaken. However, it can be said that few reports of severe eyespot appear each year.

The other soil borne disease, take-all, is of considerable economic importance and much has been said about controlling this disease in various articles including one in *Agriculture*, Vol. 74 No. 4. Selecting particular varieties of wheat cannot contribute to the control of this important soil borne disease because tests on a very wide range of wheat varieties have failed to detect any resistance. Material from the world collection of wheats and closely related species has also been tested and none shows any genetic sources of resistance. Without any such parental material it is, of course, quite impossible to incorporate resistance to take-all in any current breeding programme.

Resistance to virus diseases and pests such as eelworm and frit fly has received less attention by breeders so far, but developments in these spheres can be expected in the near future.

Oats are resistant to all the diseases of importance on wheat and barley although they are susceptible to other diseases. They are quite immune to yellow and brown rusts, *Rhynchosporium* leaf blotch and eyespot, and are not attacked by the physiologic races of mildew and take-all which infect the other cereals. However, the physiologic races of mildew which can infect oats have been shown to cause losses in yield similar to those in barley, and resistant varieties like Padarn and Manod have been developed to offset such losses. Manod has the additional attribute of being resistant to crown rust, which in the warmer and wetter West country can be serious in oat crops. In the last few years oat crops have looked particularly healthy and this could account for the good yields reported from many areas.

The production of disease resistant varieties is difficult and uncertain but the achievements in the first 50 years of plant breeding as a science have been sufficient to suggest that prospects for the future are encouraging. New varieties will be developed with more effective and stable resistance to many of the important cereal diseases than is evident in our varieties today.

This article has been contributed by **D. A. Doling, B.Sc., B.Agric., Ph.D.**, who has been Plant Pathologist in the Trials Branch of the National Institute of Agricultural Botany since 1957. He was previously lecturer in mycology at the Royal Agricultural College.

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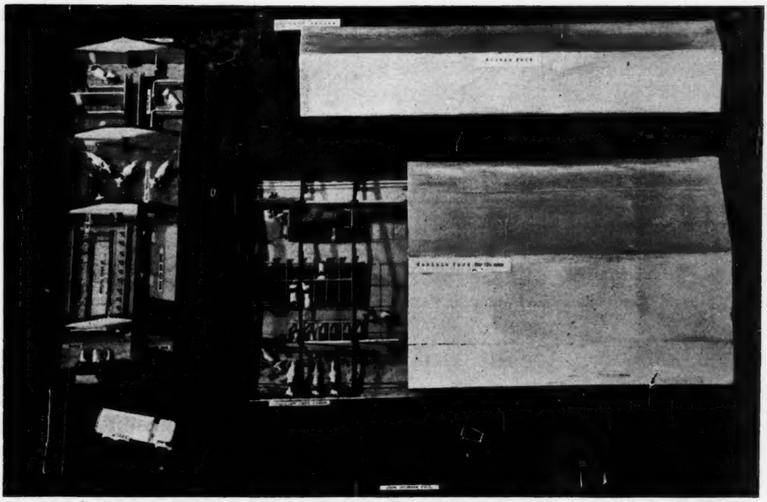
The New Dairy Unit at Inglewood

R. A. Bevan

THE Inglewood Estate of 500 acres, situated in the Wirral, Cheshire consisting of two farms and various small properties, was purchased by R. Silcock and Sons, Ltd., in July, 1964. The company retained 220 acres including Inglewood House and grounds, the Home Farm and five cottages. The land is situated in the middle of the Wirral Peninsular with the River Dee on the one side and the River Mersey on the other. The farm is on medium loam over clay and, with a rainfall of 28 in., it is in one of the best grass-growing areas in Cheshire.

After establishing the pig and poultry units, the acreage available for the dairy enterprises was only 161 acres and in July, 1964, this consisted of 70 acres of barley and 91 acres of permanent pasture. With the exception of 18 acres of permanent pasture in small paddocks around the house, the entire acreage was direct reseeded to a three-year ley in the autumn of that year.

The first herd to be established was a small self-contained herd of Jerseys. Some existing stable accommodation was converted to an 18-stall shippon, dairy, calving boxes, calf pens, and bull pen. Today, these total 36 cows and followers and the 18 acres of permanent pasture provides the summer grazing and two-thirds of the winter maintenance ration. The only other buildings were two barns and a small 6-stall 3-unit abreast parlour and a dairy. By constructing wooden cubicles in these barns it was possible to house another herd of 55 Ayrshire cows and heifers to be kept off the land entirely and fed a barley straw, barley and concentrate ration. At the present time they have just completed their second year on concrete without being fed either fresh or conserved grass. With 143 acres of grassland available it was decided to build a new dairy unit for an autumn calving herd of 120 Friesians capable of expansion to 180 cows in the future.



Aerial view of the model showing complete dairy layout, particularly the feeding fence round the outside of the large cubicle building on the right of photograph. The silage being cut in blocks and transported with buckrake and fore-end loader and placed along the length of feeding fence. The silage barn is the long narrow building at the top of the photograph

Planning the unit

There were many factors that had to be decided upon before the final plans could be drawn up. In this respect we were very grateful to the Agricultural Land Service, the N.A.A.S. and not least to the Company's Advisory Services for their help and guidance.

Planning began by drawing up plans and constructing a model of this first layout. It is so difficult to visualize all the practical problems likely to arise by just looking at a plan, and a model of the proposed layout makes this task much easier. In our case not only did it greatly reduce the capital investment per cow, but it saved us many thousands of pounds in avoiding basic mistakes alone.

How many farmers with the available capital and good stockmen have really studied the two narrower issues upon which the ultimate success of their units will undoubtedly depend? The first of these essentials must be good, thorough basic planning for smooth cow circulation with a careful study of cow behaviour. The second essential is to decide on how to handle the manure from the unit—what consistency the manure should be for the type of equipment most suited to the particular soil conditions on that farm. With cubicles has it to be 2 cwt of sawdust per cow involving slurry-handling equipment or has it to be 5 cwt of straw per cow handling the manure as a solid?

The layout finally agreed upon consisted of three buildings, an umbrella building for accommodating the herd, a silo and a dairy building containing the parlour, dairy, covered collecting yard, bull pens and calving boxes. When the specification and plans for the whole farm were put out to tender, the highest quotation was £360 per cow and the lowest was £260 per cow. This magnitude of capital expenditure could not be considered, so it was finally decided to have the three frame buildings erected on contract and to

allocate the building work to local tradesmen assisted by the farm staff. In this manner it was possible to build the whole farm complete with all services and equipment for a gross cost of £160 per cow.

Gross cost

	£
Cow housing complete with all services and equipment	4,912
Effluent, tank and midden	858
Fodder storage	2,039
Parlour and dairy and equipment	7,089
Bull pens and equipment	1,702
Roadways	1,532
Drainage and sundries	1,068
	£19,200

The net cost per cow after deducting the Farm Improvement Scheme Grant = £120 per cow.

Accommodation for the herd

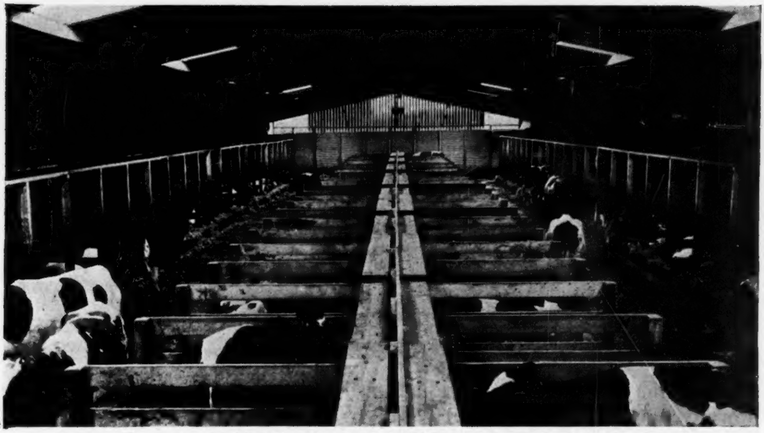
Accommodation is in a low steel portal frame building with a 12 degrees pitch and an internal span of 65 ft. On either side there are two 4 ft cantilevers covering the feeding fence making the overall width of the building 73 ft. It is 135 ft in length with roof trusses every 15 ft. The building is divided down the centre by a double row of 32 wooden cubicles with a catwalk above and the cattle are housed in two groups of 60 cows. At one end of the cubicles there is a calving box which can be entered from either section. This accommodation is often used late at night for a cow that unexpectedly shows signs of calving. At the other end it is possible to close a sheeted gate behind the last two cubicles on either side providing facilities for retaining cows for A.I. or veterinary attention without disturbing the rest of the cattle. An 8 ft wide gangway runs between these cublicles and a row of 28 wooden kennels.

The walls of a building always cost as much as the roof structure, but by having this row of kennels the cost of walling has been considerably reduced. They provide facilities on top for storing straw both for bedding purposes and for insulation. The bales can be built in such a way as to enable the temperature inside the building to remain 10 degrees warmer than outside and yet still have adequate ventilation. The straw consumption is one-third of a bale per cubicle twice a week which is equivalent to 5 cwt per cow during the winter period.

Both kennels and cubicles are fitted with adjustable headrails since they are 7 ft 6 in. in overall length and 4 ft wide. Wooden cubicles have many advantages over metal cubicles, but their most important feature is the added protection they provide which deters the 'bulling cow' from attempting to interfere with other cows in the cubicles.

Feeding facilities

From the back of the kennels to the outside of the building is a 9 ft wide covered feeding area with a feeding fence made of two adjustable parallel bars situated under the cantilever portion of the roof. It is important to have a completely separate feeding area and avoid having cubicles opposite a feeding fence, because in most cases, except where slats are installed, it results in slovenly behaviour by the cows. The narrow feeding area ensures orderly feeding by restricting the amount of space available for cows to change places on the fence and does not allow two cows to pass one another behind the row of feeding cows. Consequently, the cows select a position on the



Cubicle building with double row of wooden cubicles down the centre with catwalk above. On either side are two rows of kennels

fence and seldom change that position during the winter period. With the feeding fence being on the outside of the building it is easily accessible to any kind of self-unloading trailer, and it is also possible to feed a wide variety of different foods. It was thought advisable not to design a dairy unit to a particular feeding system but to achieve as much flexibility as possible.

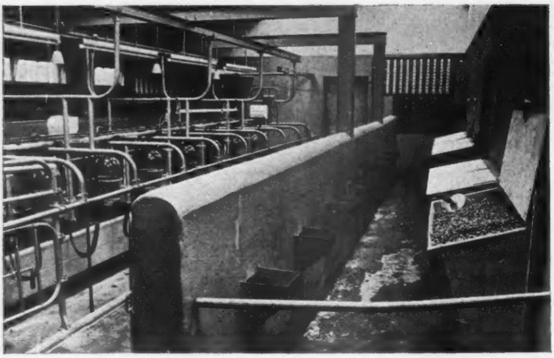
Collecting and dispersal yards

The cows are treated as two separate herds during the winter months but in the summer are grazed as a single herd. In the winter, 60 cows are collected in a covered collecting yard allowing 13 sq. ft per cow. This area is necessary because when cows are collected before milking, they will collect with their heads down and in this position they are facing the distended udder of another cow. If they have not sufficient room to move, cross-suckling will quickly develop and as a herd problem is impossible to eliminate.

Most collecting yards are designed on the assumption that a number of cows will soon be in the parlour, but in practice milking does not always commence immediately. In the summer a series of gates (which are not visible on the model illustrated) provide several different sizes of collecting yard depending on herd size. They also form passageways so that the cattle can return to their lying area after milking. It is surprising how much they use the cubicles in the summer months, when using this area as a dispersal area, even when the weather conditions are very dry. Next season the cattle may remain in the cubicles for two hours after each milking before returning to their grassland, which could help to reduce soiling and poaching.

The milking parlour

The cows are milked through an 8 unit, 16-stall herringbone parlour with low level jars and feeding troughs into a 528-gallon bulk milk tank. There is a 3 ft wide feeding passage down either side of the parlour and the concentrates are stored in wall hoppers and feeding is by hand, as there is sufficient width in the building for a feeding passage.



The 16-stall 8-unit herringbone parlour showing feeding passage and food hoppers

When the cows enter the parlour, washing is kept to a minimum and four warm water sprays are situated in the parlour pit for this purpose. The staff wear rubber gloves and dry off the cows with paper towels. This routine, coupled with teat dipping after milking and the use of a long acting broad spectrum antibiotic in the dry period, has eliminated sub-clinical mastitis and greatly reduced the incidence of clinical mastitis.

Warm floor heating in the parlour pit costing 2*s*. 6*d*. per day and operated on a time switch improves the operators' facilities and weekly recording is made easier by the installation of a tape recorder system. Because of the danger of power failures, emergency lighting is installed throughout the plant operated by a battery which is wired to the milk pump and kept permanently on charge.

The cleaning of the plant is by recirculation with boiling water and nitric acid which is quite adequate, provided the recirculation does not take much more than 6 minutes, thus ensuring that a good volume of water passes through the plant at not lower than 170°F.

Other facilities in the dairy building

The building which is 105 ft × 36 ft contains, in addition to the parlour, dairy and covered collecting yard and several other facilities. On the right of the exit passage from the parlour there is a catch pen. This is designed to be used as an additional calving or isolation box and is conveniently sited for this purpose. On the left of this exit passage is a food store with double entry and exit doors. This can be easily converted into two additional calving boxes and water bowls have been positioned at each end for this purpose. Leading from the collecting yard at the far end of the building is a footbath with a corrugated base and cattle can be diverted when necessary through this before returning to their yards or the grassland. Alongside this footbath and next to the two bull pens is a double service crate in which a small gate has been fitted in the tubular division for the vet to take blood samples. At the present time the herd has only passed the first official milk ring test. This portion also contains three more calving boxes which increases the total available calving accommodation to six.

Conservation facilities

The silo is 120 ft long and 30 ft wide and has a capacity of 720 tons of silage at a settled height of 9 ft. The sides are 12 ft high and consist of railway

waggon solebars lined with polythene sheet. The grass is cut direct into trailers with a 48 in. offset forage harvester and the pit is sealed every night during making, remaining sealed when the harvesting operations are complete. This sealed wedge is opened for the second and third cuts of silage when the balance of the bedding straw and hay are stored on top. In the winter the silage is cut out in blocks measuring 5 ft × 3 ft × 1 ft using a chain saw with a modified wood chain. These blocks weighing 600 lb are then placed alongside the feeding troughs, the whole operation taking about 20 minutes. It is then forked into the trough by hand each end of the day.

Manure disposal

As the land is heavy we must be in a position to store our manure for a long period, for spreading when the conditions are suitable. We had a choice of two systems, i.e.,

(*a*) bedding with sawdust and treating the manure as a slurry and storing it in an above ground silo. This would have been 40 ft in diameter and 15 ft high, with a capacity of 120,000 gallons (at a cost of 1·5*d.* per gallon stored) and with a small 10 × 10 ft receiving tank and pump;

or

(*b*) bedding with straw and treating the manure as a solid and providing a concrete apron for storage, with a small underground tank for foul water from the parlour pit, collecting yard and roadway between the cubicle and parlour buildings.

This latter system was chosen primarily as it enables the disposal of the solid manure and foul water to be carried out with our existing equipment. All the rainwater and water from the dairy is piped separately and discharges into the ditch.

The first year's performance

The Inglewood results taken from the Cheshire N.A.A.S. Dairy Management Scheme were as follows:

Average number of cows	100·5
% Dry cows	15
Average yield per cow in gallons	1,194
Concentrate use in lb per gallon	3·3
Margin per cow, milk over concentrates	£134·6
Stocking rate per forage acre in cow equivalents	1·1
Fertilizer cost per forage acre	£6·37
Purchased hay or grain per forage acre	£2
Margin per acre, milk over concentrates, fertilizers and all purchased foods	£114 per acre

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R. Bevan was awarded the Dulcie Gold Medal of the Royal Agricultural College in 1955. After three years' commercial experience he became Farms Manager to Lord Leverhulme in charge of three dairying herds and 600 acres, and was Chairman of his N.F.U. branch. Since 1964, he has been Farms Manager to the Silcock Development Farm at Inglewood. Mr. Bevan obtained a place on the Advanced Farm Business Management Course in 1964. He is Chairman of the Cheshire Branch of the Farm Management Association and a Council member of the National Association.

Growing Field Beans

J. J. North

In recent years there has been an increasing interest in field beans, following the decline in acreage to under 100,000 acres during the late 1940s. Reasons for this growing interest are various. The relatively high prices paid for a small quantity of a size and quality suitable for pigeon feed attracted a number of speculators even though this market only provides an outlet for about 25,000 tons. More recently reasonable quantities have been exported to the Continent at a time when some intensive cereal growers were looking for a break crop giving a reasonable return with no specialist machinery requirements. The final stimulus was given at this year's price review when it was announced that £5 per acre would be paid for crops harvested after July, 1968. In the past many heavy land rotations have by tradition pivoted on the bean crop, almost half million acres being grown in this country in the late 1880s. Since those days the acreage has gradually reduced, due mainly to the relatively low yields obtained and the extreme variability of yields from year to year, farm to farm and even field to field.

Without doubt many other factors have contributed in the past to the decline in the acreage of the bean crop. Setting aside the economic one of the availability of cheaper sources of protein, the depredations of pests and disease, weed control problems and an inadequate understanding of the husbandry of the crop have all contributed to its unpopularity. Times, however, appear to have changed and yields of beans exceeding 30 cwt per acre are now being obtained when modern growing techniques are followed.

Varieties

Part of the improvement in yield obtained in recent years has been from the use of improved varieties, many of which cannot be regarded as true varieties due to the cross-pollination which takes place. Synthetic varieties are also available, where the farmers' seed is obtained by growing several selected strains and mixing them to produce the commercial variety. Care should be taken to purchase seed only from a reliable source, to avoid obtaining inferior varieties.

Husbandry

Date of sowing is of paramount importance in the pursuit of high yields. Mid-October sowings are best for winter crops, September drillings may become winter proud and suffer more frost kill whilst sowings in November or later are risky, as complete failures frequently occur from subsequent pest and disease attack. Ideally spring beans should be sown at the end of February

or early in March; the yield falls off appreciably with delayed drillings, simazine is less effective for weed control and risk of damage from aphid attack increased.

The soil must have a minimum pH of 6·5, whilst the results of most other experiments on the manurial requirements of the crop have largely been inconclusive. Where more conventional rotational farming is practised, the soil reserves of phosphate and potash are frequently sufficient to grow a satisfactory crop of beans. In an intensive cereal system the application of 30 to 40 units of P and K to the seedbed may be a justifiable insurance. Crops grown in narrow rows (up to 9 in.) combine drilling 20 units of P and 40 units of K is often worth while. Only very occasionally has this crop shown any response to nitrogen, but there may be local conditions where a small dressing may be required, particularly following wet weather in March or April.

In farming practice seed rates vary widely, ranging from as low as 1 cwt per acre up to 3 or more cwt per acre. Time of sowing, soil conditions and method of planting all influence the choice in field practice. Experiments have shown that for early-drilled crops of winter beans 2 cwt per acre should always be planted and that where home-grown seed is planted 2½ cwt should be used. Evidence for the spring crop is much more scanty: around 200 lb per acre should be sufficient for the small seeded tick, 250 lb per acre for the larger varieties. There does not appear to be any consistent relationship between row width (up to about 21 in.) and yield. Choice of row spacing should therefore depend on other factors such as possible fertilizer response from combine drilling, equipment available for sowing the crop or even weed control methods.

Weed control

A very satisfactory control of all shallow germinating weeds can be obtained following the use of simazine in winter and early-sown spring crops. Treating winter beans with this chemical gives an excellent control of black-grass, and is a useful method for keeping this weed under control in predominantly winter cereal rotations. The crop must be drilled deeply with at least 3 in. of soil cover after the soil has consolidated to avoid chemical damage. Normally the spraying should follow the final harrowing after sowing the crop, as simazine is less effective if the soil surface is dry. Applications to late-sown crops may be disappointing. Post-emergence applications can be made to winter beans in the early spring before new growth commences, but the treatment may be less effective if the weeds are large at the time of application.

Simazine will only control wild oats germinating from near the surface; where severe infestations are expected band spraying of simazine plus inter-row cultivations are the most effective and economical. Perennial weeds must also be controlled by cultivation as there are no suitable herbicides available.

Disease

The major disease of economic importance is chocolate spot (*Botrytis fabae*) and then only in winter-sown crops. An epidemic only builds up in moist warm weather conditions and is more frequently associated with the milder areas of the country. Little can be done about this disease other than

avoiding winter sowings in susceptible districts. Crop hygiene can also assist as the disease carry over is reduced if all old bean crop debris is destroyed or buried before the sowing of a new crop in adjoining fields.

Pests

The black bean aphid (*Aphis fabae*) has been the major pest of spring beans, especially the late-sown ones and particularly in certain areas of the southern counties. In some localities serious attacks of black bean aphids occur in almost every season, causing loss of yield and sometimes stunting and death of plants. Under these circumstances prevention is better than cure and the use of a modern systemic aphicide, such as menazon, phorate or disulfoton, just prior to flowering is well worth while. Applied just before flowering these chemicals will normally supply protection during the critical period.

In other areas build-up of aphid populations are very seasonal and where sporadic attacks only occur, the expenditure of £2–£3 per acre on the above chemicals every year may not be justified. Costs can be reduced in these areas by restricting the preventive application of the chemical to the headland only. Experimental work has shown that infestations normally start on the headlands and in all except the extreme aphid years, the pest may be controlled by this headland treatment. On the other hand where a sudden seasonal attack develops or previous chemical treatments have failed to prevent an attack developing, application of chemicals based on dimethoate, demeton-methyl or oxydemeton-methyl will give a quick knockdown and kill. *Adequate precautions must be observed when making these applications to avoid killing bees and other pollinating insects. If the crop is already in flower, the application of phorate or disulfoton granules is much less hazardous to bees than the use of liquid sprays.* Winter beans are very much nearer to harvest when aphid attacks develop so will normally suffer only minor damage and are unlikely to justify spraying.

The only other insect pest of any consequence is the bean weevil (*Sitona* spp.) which causes the typical weevil damage to foliage. Experiments have shown that the bean plant can withstand considerable defoliation without the yield being affected and this foliage damage is seldom important. Late-sown spring beans may be affected under poor growing conditions, when an application of DDT as a spray or dust will give good control.

Winter versus spring varieties

In spite of the small-seeded spring bean commanding a premium for pigeon feed, most of the acreage will go to the compounder who is likely to prefer the larger seed size. Winter beans are all large seeded and usually outyield spring beans by about 5 cwt per acre except in areas where chocolate spot is prevalent. Risk of crop failure is greater than with the spring crop on all except the 'droughty' soils. Spring beans are, however, prone to aphid damage and are seldom ready for combining until mid-late-September. This may prevent the sowing of winter wheat, whereas the winter crop which matures about one month earlier will usually provide a suitable entry.

Problems

In spite of the adoption of these new techniques problems still exist. To some extent new varieties and husbandry techniques have improved the yield

potential of the crop and it has become more reliable. In comparison to cereals, however, it is still a relatively unreliable crop and failures occur regularly. Machinery used for handling beans should be more robust than for cereals; augers can easily be damaged by overloading. Losses at the cutter-bar during combining can be up to 5 cwt per acre, so it is often better to try and cut the crop under dull, overcast conditions. As much of the crop increase will have to be taken up by compounders, care must be taken in drying of the crop. Floor drying and radially-ventilated bins using little or no heat are satisfactory systems; continuous driers unless very carefully operated usually produce too many cracked beans to be accepted by the trade. Cracking during drying is usually not an objection if processed and fed on the farm.

Developments

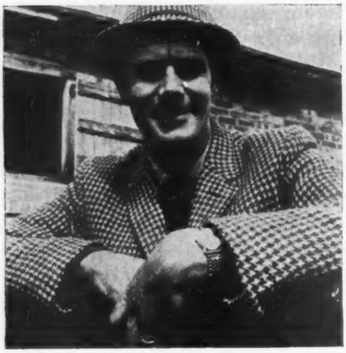
Much of the improvements in yield and reliability will come from the plant breeder. Developments in producing hybrid varieties are fairly well advanced; these varieties produce higher and more reliable yields. There are, however, still difficulties with the economic production of hybrid seed. In addition, strains of beans have already been bred which show resistance to black bean aphid attack in the field; others have reasonable resistance to virus disease. Progress in weed control is also providing alternative post-crop emergence herbicides which may replace simazine. This could help the farmer who prefers to broadcast the seed and plough it in rather than cultivate and drill as separate operations.

Finally one important factor which appears to affect the reliability of yield is the interaction of the plant with season. Under good growing conditions beans will make considerable vegetative growth at the expense of seed yield. Growth regulation chemicals are now being tested to help control this excess growth with the object of improving reliability of yields. We can only await developments.

WARNING OF RISKS TO BEES

Bees are valuable as pollinators of field beans; do not spray insecticides on beans in flower as this will kill the bees. Consult your local Agricultural Adviser before your beans come into flower and he will advise on preventive sprays; if beans are already in flower he will advise how, with least risk to bees, to deal with aphids.

This article has been contributed by J. J. North, B.Sc., M.S., Dip. Agric., who is Regional Crop Husbandry Officer in the Eastern Region of the N.A.A.S.



Clive Scott

The Lake Vyrnwy Hill Sheep Enterprise

LAKE Vyrnwy is a man made reservoir, situated in beautiful surroundings nine miles west of the small market town of Llanfyllin in North Montgomeryshire. The construction, by the Liverpool Corporation, of the Lake Vyrnwy works was started in 1881. By 1891 the 4¾ mile long and ½ mile wide lake was supplying Liverpool with water by direct aqueduct of some 68 miles. The masonry dam across the natural valley of the Avon-Vyrnwy was the first high dam in Great Britain and the lake formed the largest artificial reservoir in Europe at the time of construction.

As the reservoir is for a direct supply, unlike the new reservoirs of Clywedog and Tryweryn which are river regulating schemes, it was important for the Corporation to control the whole catchment area, consisting of 23,000 acres. Of this land, approximately 5,000 acres have been planted with Larch, Douglas Fir, Sitka and Norway Spruce under a scheme run jointly with the Forestry Commission. The planting was considered desirable from the water management aspect and the land was made available between 1920 and 1930, as the farm tenancies terminated. The lowland fields and the ffriddoedd of these farms were planted but most of the mountain was above the line then considered the maximum for satisfactory afforestation. This mountain land which rises from 1,300 feet to 2,100 feet with a rainfall varying between 65 and 95 inches per year now forms the bulk of the 11,300 acres farmed by the corporation. Only 700 acres of this is enclosed land.

Stocking

The stocking of the land farmed by the Corporation consists of 6,400 Welsh Mountain ewes running with 200 rams and 1,600 ewe lambs. Eighty single-suckled breeding cows, mainly Herefords and Welsh Blacks, with their

followers complete the stocking. Spring-born calves are generally sold as yearlings, although the smaller ones may be kept and sold as 18 month store cattle.

For many years an annual sheep sale has been held at Lake Vyrnwy on the third Saturday in September when buyers from as far afield as Anglesey and South Shropshire have the choice of over 1,000 hardy Welsh ewes, and several hundred ewe and wether lambs. As it takes about three weeks to gather the nine flocks, the organization required for this event is of course quite considerable.

The Corporation is to be congratulated on taking its responsibilities to the surrounding community so seriously. A magnificent community centre with assembly hall, library, billiard room, canteen and workshop has been built by them. It also helps to support financially the various sports and social activities in the village, but undoubtedly its most important contribution is the employment, directly and indirectly, of approximately 110 men. This high labour force may be unjustified on purely economic grounds; however, in spite of a 34·6 per cent decrease in population in Montgomeryshire between the years 1881 and 1961, the population of Llanwddyn has only decreased by 16·7 per cent. The slowing down of the depopulation of Llanwddyn is, in the main, undoubtedly due to the Corporation's efforts.

On a mountain farm of this type there are two alternatives; either to ranch the land with a minimum of labour, or, to intensify as far as possible, utilizing all the available resources. The latter has been the choice taken by the Corporation.

The problem

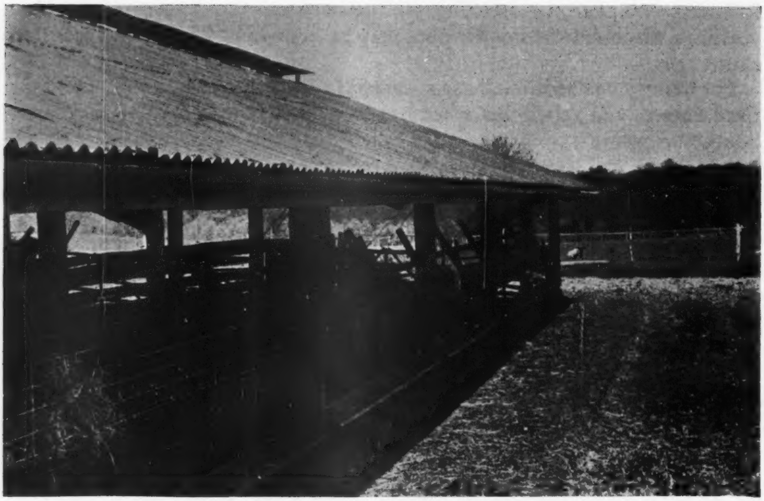
Like most mountain farmers, the Corporation is faced with the dilemma of falling prices of draft ewes, wool and store lambs, coupled with rising costs. Intensification is more difficult than on the lowlands as less land is under the plough; there are no arable by-products or winter corn to graze. Output is difficult to increase because:

1. the stocking has to be based on the winter carrying capacity of the mountain which results in undergrazing during the summer;
2. of shortage of bottom land and ffridd, the majority of the ewes have to lamb on the mountain. The percentage of lambs reared is therefore low due to a shortage of milk, unfavourable weather, and the difficulties of shepherding at this time;
3. of unevenness of soil type, lack of access, difficulty in fencing, and the expense of cultivation. Surface treatment, particularly on the wetter, stonier land, would appear to be the only course justified, but concentrating on the more accessible land first.

Possible way ahead

The importance of a vigorous clover plant in any reclamation work is well known, both for its ability to fix atmospheric nitrogen and, as Rae[1] in New Zealand has shown, the improvement of carcass quality of the sheep. Work on a plot scale on the estate by the University College of Wales,

[1]Rae, A. L., Brougham, R. W., Glenday, A. C. and Butler, G. W. Pasture type in relation to liveweight gains, carcass composition, iodine nutrition and some rumen characteristics of sheep. J. agric. Sci. Camb. **61** 187 (1963).



A type of sheep shed successfully used by Col. Round

Aberystwyth, in conjunction with the National Agricultural Advisory Service, has shown that clover establishment has been substantially improved by inoculation with an effective strain of Rhizobium and the lime pelleting of seed. This work has been carried out on a site at a height of 1,700 feet above sea level on acid, peaty land, with a pH of 4·1. An initial dressing of basic slag with the treated clover and ryegrass seed has produced a reasonable sward at moderate cost. It is likely that maintenance dressings of basic slag will have to be applied every two to three years. The improvement and increase in stock numbers will be slow and will run concurrently with the intensification of overwintering methods and improved skill of management.

Over the last few years the ewes have improved considerably due mainly to the careful buying of first class rams from North Wales. The resultant home bred ram lambs are being Performance and Progeny Tested by the Cymdeithas Defaid Mynydd Maldwyn—the Montgomeryshire Mountain Sheep Society. It is hoped that as a result of these tests there will be a still greater improvement of the flock.

A proposed study

Due to the rising costs and the difficulty of obtaining suitable tack grazing for the replacement ewe lambs, the Corporation has been wintering them on the estate. Trials have been undertaken with these animals and it has been shown that under the conditions at Lake Vyrnwy the ewes' subsequent performance in terms of lambing percentage, wool weight, and quality is as good as those that were tacked away on lowland farms during the winter. The saving in cost would appear to be between 5*s*. and 10*s*. per ewe lamb.

Is there a case for in-wintering the rest of the breeding flock? It is proposed to study one of the flocks at Lake Vyrnwy in the near future. A pole barn similar to the building designed and successfully used by Colonel Round in Essex, modified for hill conditions, will be constructed. This will initially

house 100 Welsh Mountain shearling ewes in groups of 12–15, but may be extended to house 2,000 at a later date if preliminary results are satisfactory. The stocking on the mountain will then be increased to replace the shearling ewes housed during the winter. The ewes will be housed from the middle of January until the middle of April. This period has been chosen because it is essential that the ewes and the lambs return from a relatively high level of nutrition to the mountain as the grass growth commences. It is extremely difficult to budget and cost a project of this type because there is little experimental guidance for assessing:

(*a*) the effect on the flock as a whole, taking into account the difference in performance of housed ewes, compared with those left on the mountain during the winter, and

(*b*) the effect of undergrazing the hill during the summer.

Initially, shearling ewes will be housed as they are likely to respond better to higher levels of nutrition and shepherding than any other age group of ewes.

Experience alone will decide the final level of stocking and how many extra ewes can be kept as a result of housing the flock. The increase in lambing percentage alone will not cover the cost of housing; there must, therefore, be an increase in ewe numbers or a significant increase in the weight and quality of the store lambs at the time of marketing.

At present, the Corporation sells the majority of its lambs on the store market which has been increasingly weak over the past few years. Unfortunately, due to the lack of lowland on the estate, very little rape is grown or grass aftermath available for fattening the lambs, and any such land is at present used for wintering a small proportion of the ewes. Some lambs have been successfully fattened indoors but the results have been very variable. As with any intensive project the skill of the stockman is of vital importance. Some shepherds have been able to finish lambs resulting in an extra margin over food cost of about £1 whilst others have found it difficult to cover the food cost. It has been found that the store price in the autumn must be very low and the selling price high early in the New Year before any extra profit can be made from intensive barley fattening of lambs.

The Corporation is extremely progressive in its forward thinking and against great odds is trying new ideas which are likely to make a most valuable contribution to the future prosperity of many Welsh hill farmers.

The author gratefully acknowledges the help given to him by the Liverpool Corporation Water Department at Lake Vyrnwy and, in particular, Mr. David Rowlands, the Resident Agent, without whose encouragement and enthusiasm the observation studies referred to would not have been undertaken.

Clive P. Scott, N.D.A., C.D.F.M., is a District Agricultural Adviser in Montgomeryshire. A farmer's son, he did three years' training st Seale-Hayne Agricultural College and a year at the Berkshire Farm Institute, before joining the N.A.A.S.

Management Factors affecting Shell Quality

H. A. Elson

THERE is a growing anxiety among poultry keepers over the losses sustained through cracked and faulty egg shells. This anxiety will be understood when it is realized that the average return per dozen for second quality eggs is under 1*s*., while the majority of poultry farmers incur charges of around 2*s*. to 2*s*. 6*d*. per dozen in producing eggs. With a laying flock averaging 240 eggs per bird, 1 per cent of second quality eggs means a loss of 4·4*d*. per bird per year, assuming average selling prices of 2*s*. 9*d*. per dozen for first quality eggs and 11*d*. per dozen for seconds. On this basis 10 per cent seconds would involve an annual loss of between £900 and £1,000 on a 5,000 bird flock. The concern over losses from shell cracks arises not only from the percentage of eggs down-graded at packing stations but because this figure, in spite of advances in our knowledge of breeding and feeding, appears to increase rather than decrease (Table 1).

Table 1*

Period	Percentage seconds	Approximate percentage cracks
Jan—Dec 1964	6·3	4·7
Jan—Dec 1965	6·6	5·0
Jan—Dec 1966	6·4	4·8

*Source—British Egg Marketing Board.

To this number down-graded by the candlers must be added those obviously grossly cracked eggs removed during collection or packing at the farm. In a survey described below the percentage of all eggs cracked, i.e., gross cracks and hair cracks amounted to 5·8 per cent of all eggs produced.

A survey

While eggs may suffer cracking at any of the various stages between laying and purchase, the majority appear to suffer this fate at the farm itself. A pilot survey was, therefore, initiated in an attempt to determine the major factors causing cracks and, where possible, to formulate advice on the elimination or reduction of these adverse agencies. To obviate the

personal factor, candling was done by one person throughout, who tested a random sample of eggs produced by laying flocks on the 26 participating farms.

At the conclusion of the survey which lasted over 42 weeks, the percentage of cracks recorded was compared with those variables found on the several farms, e.g., type of cage floor, the frequency of collection, breed type, etc. It is realized that on each farm a number of variables was involved and, therefore, it was impossible to exclude all except a particular one which might be the trouble. Nevertheless, a straight comparison between one condition, e.g., age of birds and percentage of cracks recorded, did show definite trends and, in some instances, statistically significant differences. Some of the more striking findings are described below.

This article has been contributed by **H. A. Elson, N.D.P.**, who has been Poultry Husbandry Adviser for the National Agricultural Advisory Service in Berkshire since 1966. Previous to taking up this appointment he held a similar post in Essex for three years.

Type of cage floor

The percentage of cracked eggs experienced with wire netting cage floors was significantly lower than with rectangular welded wire floors (Table 2). The difference of 2·7 per cent is worth 1*s*. per bird per year on the basis of the calculation used earlier.

Table 2

Type of floor	Percentage cracks and hair cracks
Rectangular welded wire	6·3
'Wire netting'	3·6
Difference	2·7

There are several possible reasons for this finding:

1. When the egg is laid and dropped on to the cage floor wire mesh is more flexible at the point of contact.
2. Eggs tend to roll more slowly down a wire-netting floor.
3. The wire-netting floor is fixed to a rigid wooden frame whereas the welded wire floor is generally hooked on at the back and simply rests on a support at the front, This means that when a bird jumps, the eggs in the collecting area are less likely to be jostled and cracked with the wire-netting floor.

There may be differences between various welded wire cage floors in respect of percentage cracks. Indeed, there may be a welded wire floor that is as good as the wire netting from this point of view.

It is thought that some investigation into cage floor design is required to compare the percentage cracks experienced with floors of different materials, meshes, gauges of components and slopes. A further question which needs answering is 'where are most eggs cracked—on their first contact with the cage floor, as they roll down, or in the collecting area?'

Age of bird

It is well known that more cracked eggs are collected from older birds and this finding was confirmed by the following results:

Table 3

Age (*to nearest* 10 *weeks*)	Percentage shell faults
25	2·5
35	5·8
45	4·5
55	6·8
65	8·1
75	8·2
85	8·4
95	7·0

This effect is almost certainly due to the fact that shell quality declines as birds age. It may, therefore, be necessary to collect eggs more frequently from older birds. This increase of cracks with age will also affect the most economic time to dispose of a flock.

Respiratory disease

Following outbreaks of respiratory disease when egg production drops, there is often a problem with second quality eggs, e.g., shell-less eggs, poor shells and watery whites. In this survey each flock's history in respect of respiratory disease was recorded and where the record was positive, infectious bronchitis was often thought to be involved. The effect on shell quality is seen below:

Table 4

	Percentage shell faults
History of respiratory disease	8·2
No history of respiratory disease	4.6
Difference	3·6

(No. of eggs involved: History 5,600
No History 11,800)

This result shows that an outbreak of respiratory disease can cause serious financial loss, not only due to the drop in egg production, but to the high proportion of 'seconds' produced over a long period. As with older stock, careful handling of eggs is particularly important where birds have experienced respiratory disease during the laying period.

Breed

There seems to be a marked difference in the shell quality of eggs laid by different breeds. This may be linked with production—that is the more eggs a bird lays the higher the proportion of cracks. In this survey the percentage of cracks varied from 3·6 per cent for one light hybrid to 7·4 per cent for another. However, due to other variables involved it is not possible to say whether this result is significant.

Frequency of collection

The number of egg collections each day probably has an important effect on the percentage of cracked eggs. When several birds are housed in one cage there is a possibility of eggs colliding and cracking in the collecting area in the front of the cage floor. The likelihood of this happening is reduced if eggs are collected frequently.

In this survey the majority of farmers collected only once a day and it was not possible, therefore, to measure the advantage of several collections a day. However, in a few cases where a high percentage of cracks were a problem, several collections a day were shown to reduce cracks. The weaker the egg shell the greater the importance of frequent collections.

Calcium and phosphorus content of food

Many different feeds were involved and all were analysed for calcium and phosphorus content. There were no obvious differences in percentage cracks with a wide range of calcium levels, except for one case where the calcium content was only 1·1 per cent and the level of cracks was 15 per cent—well above the average for the survey. Levels of calcium in the feed between 2 and 4 per cent seem to give reasonable results. It should be pointed out, however, that the food intake of the birds was not recorded and it was not, therefore, possible to measure the actual amount of calcium or phosphorus consumed. No real differences were shown with various phosphorus levels in the food or with a range of calcium phosphorus ratios.

Other factors

Some interesting points were noticed in the results of one particular light hybrid, all flocks of which were housed in welded wire floor cages. An increase in the number of shell faults with a rise in house temperature was noted. At 50°F the percentage cracks was 5·3 and at 70°F 6·9. It is known that a bird's appetite tends to decline in hot weather and it may be necessary therefore to increase the calcium level in the feed to achieve the necessary calcium intake.

An increase in the percentage cracks was noticed with an increase in the number of birds per cage. This did not necessarily correspond with an increasing stocking rate or a decrease in cage frontage per bird. Three birds per cage produced 5·6 per cent cracks and six birds per cage 9·0 per cent. Presumably there is a greater likelihood of birds being disturbed as the number of birds per cage increases; when birds jump, eggs waiting to be collected tend to get cracked.

There appeared to be a progression in the percentage of shell faults with an increase in the phosphorus content of the food. This is difficult to explain unless it is part of some calcium, phosphorus, trace mineral balance.

Conclusions

The ideal might appear to be a bird free from respiratory diseases (or with an immunity to them), housed in a 'wire-netting' floored cage, genetically capable of producing a large number of strongly shelled eggs. However, even in such Utopian circumstances this bird would still age and it is unlikely that the shell quality problem would be eliminated!

In selecting laying stock on test results attention should be paid to the percentage seconds in the egg gradings as well as to other factors. If new cages are to be installed, it would be wise to attempt to obtain data on their function with relation to shell cracks in view of the fact that this limited survey showed a significant influence with cage floors of a specific type. Every effort should be made to keep flocks free from respiratory diseases since this can result in a high percentage of seconds. Eggs from older birds should be handled very carefully since their shells are more likely to crack on handling. It may not be economic to keep birds in lay too long, because of the deterioration in shell quality.

Acknowledgments

I wish to thank the following for their kind assistance in the preparation of material for this article:

Dr. N. R. Knowles (British Egg Marketing Board); Dr. F. B. Leech (Rothamsted Experimental Station); 26 Essex Farmers who willingly co-operated. Also colleagues in the National Agricultural Advisory Service and other services of the Ministry of Agriculture, Fisheries and Food.

Foot and Mouth Epidemic

£10 per acre Ploughing Grant

The special £10 per acre grant for ploughing up grassland will be provided, subject to Parliamentary approval, to farmers who have lost their stock as a result of the current foot-and-mouth disease epidemic and who wish temporarily to expand their cropping.

The grant is available to farmers whose livestock have been slaughtered after 24th October, 1967, because of an outbreak of foot-and-mouth disease on their holdings, and who are occupiers of the land both at the time of slaughter and on completion of the ploughing and subsequent operation. Those whose stock have been slaughtered while agisted or grazed on common or other land associated with the holding may also be eligible, subject to certain limitations. The land ploughed must have been continuously under grass since before 25th October, 1967, and at the time of slaughter. Ploughing must be carried out in the period 25th October, 1967, to 31st May, 1968, and must be followed by one of the subsequent operations specified in the Scheme i.e., a second ploughing, rotavation, discing, cultivating etc., or the spreading of lime or fertilizer, or sowing and planting.

Prior approval is not required but it is a condition of the Scheme that the land must be suitable for ploughing and cropping, and the advice of the National Agricultural Advisory Service is available to farmers who wish to assure themselves on this point. There is no special list of crops, but the Minister wishes to emphasize that the special purpose of this grant is to help those farmers who have had their animals destroyed to get an income from growing a cash crop.

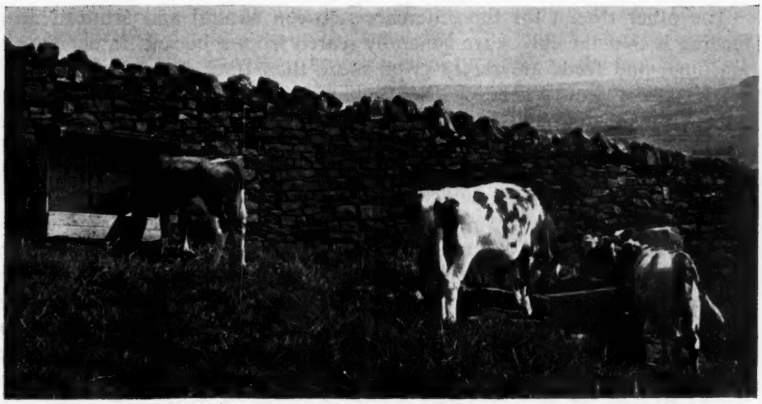
Further information may be obtained from the divisional offices of the Ministry, where application forms will be available from 28th December.

Claims for grant must be received by the Ministry by 31st March, 1968, or by the end of the month following that in which the ploughing was completed, whichever is the later.

Farmers who have already ploughed up since 25th October will not be ruled out for that reason. They are advised to contact their local divisional office without delay.

Grass for Spring-born Calves

C. H. Mudd *Director, Great House Experimental Husbandry Farm*



THERE are very good reasons for the old adage that a calf born in the new year should never be turned to grass in the same summer. In the past, experience showed that these calves rarely did well at grass. They tended to start well, especially if given milk or milk substitute by bucket early in the year, but by midsummer they were showing signs of ill-health, staring coats, poor growth, scouring and generally faring badly. It was generally found that calves kept indoors for the first summer and fed hay and concentrates grew better and were far healthier than those which were at grass.

But in spite of these experiences everyone was aware that suckling calves born and reared on grass all their lives rarely experienced this sort of trouble. Why should there be this vital difference between milk from a bucket and milk from a cow? There are two main reasons—management and natural immunity.

Management

Because the suckler cow and calf are both eating grass, there is a need for additional pasture in mid-season, particularly as the natural flush of

grass falls off in late June. At this time the aftermaths are starting to grow, so it is natural that both the cow and calf should be moved on to the fresh pasture provided by the aftermaths. Recent research at Weybridge has shown that there is a very rapid build-up of worms in July when the eggs dropped from earlier grazings are hatching. Fortunately this is the time when the cow and calf are often moved on to fresh ground so that they should miss this sudden outburst of infection. On the other hand, calves reared on the bucket are generally left in a handy croft where feeding is easy and they can be watched. Since they do not eat much grass there is not the same pressure of grazing and the small field will produce enough grass for them right through to August. This means that when the pasture is at its most infective stage in July, the calf is eating more grass and with it the sudden increase in infective larvae which can be so dangerous.

Natural immunity

The other reason for the difference between natural and artificial milk feeding is that the calves are generally reared from a bucket, rather than a machine, and feeds are rarely given more than three times a day—more often only twice. Whenever the suckling calf feels hungry it goes to drink from its dam and as a source of food the grass is ignored for some weeks. Every now and then the calf may pick up and chew a leaf of grass, not to satisfy its hunger, but out of idle curiosity. These single blades probably carry some small infection, perhaps carried over from the previous year; not enough to do any harm, but just enough to set up the reaction within the calf which builds a natural immunity against these parasites. Husk is a typical example—calves subjected to low intensity infection can build a natural resistance which enables them to pasture infested land in later life without being troubled by the disease. In the case of husk this resistance can be induced artificially by the use of an oral vaccine, but it can also be acquired in the field.

The bucket fed calf, however, becomes hungry between feeds and eats the grass, not out of curiosity as the suckled calf does, but to satisfy its hunger. Consequently too much grass, and with it the larvae, is consumed before the natural resistance has been built up, so the calf falls a victim to parasitic gastro-enteritis.

Calf rearing

To practise the traditional methods of rearing, that is to keep the spring-born calf inside for the first summer, is an expensive way of feeding. The cost of milk, hay and concentrates consumed from birth in March until October when the calf would be indoors in any case, amounts to about £13 10*s*. This could be reduced considerably if advantage was taken of grass feeding.

At Great House Experimental Husbandy Farm we have been using a rearing system for the past eight years which has proved entirely satisfactory, giving a weight gain comparable with indoor rearing, yet making the maximum use of grass for the summer period. The calves born in the spring or early summer receive colostrum for four days and continue on twice-a-day feeding of milk until they are three weeks of age when they are weaned abruptly. An early weaning mixture is offered *ad lib.* from a week old, together with water and good hay. It is important to put the concentrates in a bucket

similar to the one in which the milk is fed, for the calf then associates the bucket with food and takes an interest in its contents.

For a fortnight after weaning the calf receives as much of the early weaning mixture as it will take, together with water and hay so that it really gets to know the appearance and taste of the feed. When the calf is five weeks old it goes out to a pasture which has been free from older cattle all the winter. We have in fact used the same calf paddock every year without ill effect, but no older animals have ever been allowed in. A dry day which is not too windy is chosen for turning out on to grass and the calves are not brought in again afterwards; the only shelter available is the dry-stone wall surrounding the field.

A trough or hopper with an overhanging lid so that the contents are sheltered from the rain is placed in the field, preferably near the water trough and steps are taken to ensure that the early weaning mixture is always available. During the fortnight before turning out, the calf has become thoroughly accustomed to this feed and as soon as it goes into the field it looks for it and continues on the same diet. The trough, in fact, replaces the suckler cow, for whenever the calf is hungry it goes to the trough, which it uses instead of its dam, and the grass is ignored. After a few days the calf takes the odd blade of grass, again not to satisfy its hunger, but out of idle curiosity and gradually it reacts to the challenge of the parasites so that the natural mechanism of resistance is built up. By the time the calves are three months old, that is, seven weeks after turning out, the concentrates are removed or the calves moved to another paddock and from then on they live entirely on grass.

Because the calves eat so little grass and rely on concentrates in the early stages, the surplus grass has to be taken off with the forage harvester and put into the silo, but once the concentrates are removed and the calves are eating nothing but grass, they soon get on top of it and are ready for a change of field by July. Fortunately this is just the right time for a change, for, as I have already mentioned, the infected pasture is in its most dangerous stage at this time and the clean aftermaths following silage and hay cuts are ready for grazing so that the calves are moved on to the clean swards and miss the rapidly hatching larvae on the early grazed paddock.

In October, grass loses its nutritive value and the rate of growth in the calves starts to slow down. We have found that liveweight gains fall to about 1 lb a day at this time of the year and at this stage the calves should come in before their growth becomes further checked.

In a comparison made between a group of calves indoors on hay and concentrates and a similar group reared outdoors on this system, the liveweight gain per day was exactly the same—1·35 lb. The cost, however, was very different. Calves kept inside cost £13 13*s*. each for milk, concentrates, hay and bedding. Those outside cost £8 8*s*. for the same items plus grazing costs, a difference in favour of outdoor rearing of £5 5*s*. and in addition there was a considerable saving in labour through outdoor rearing.

A bonus benefit from outdoor rearing is the opportunity to rest the calf pens. However well the pen is scrubbed and disinfected after holding a calf, there is no substitute for resting the whole house. The paddock used for spring-born calves should never be used for the summer-born calves, for they must go into a clean field.

The main points to remember in using this system are:

1. Get the calves used to the early weaning concentrate without milk feeding for a fortnight before they go out.
2. Turn out on to a clean rested pasture.
3. Move on to aftermath early in July.
4. Make sure that the trough for concentrates is always full until the calf is three months old.

Replacing the Lost Cattle

This article has been prepared specially by W. R. Smith, B.Sc. (Agric.), N.D.A., Director, National Agricultural Advisory Service, in order to assist farmers in the speedy replacement of their lost cattle.

The devasting epidemic of foot-and-mouth disease has ravaged the dairy cattle stocks of the West Midlands, especially in Cheshire and Shropshire, and the urgent problem is their speedy replacement.

This can only be achieved by extra effort on the part of farmers who have been fortunate enough to escape the scourge. Even with this extra effort it will take some time for the herds in the affected areas to regain normality. Immediate sound planning of rearing and mating is therefore vital.

Normally it is good policy to maintain a young herd but *there are many older cows capable of at least one further lactation before culling. These should be retained thus releasing valuable surplus heifers for sale.*

It is still the policy on many farms to calve down heifers of the large breeds at or near three years old. The capacity for growth of present-day cattle along with good feeding and management makes earlier calving possible. Farmers who have practised two-year calving of well-grown heifers are very satisfied with the results both in terms of yield and longevity and, of course, have the advantage of an extra crop of calves.

There must be many heifers which are sufficiently well grown and can be put to the bull now, thus providing additional down-calvers for early autumn. Moreover, yearling heifers fed well from now on could be mated later for calving during the winter of 1968–69. All suitable heifer calves should be kept and reared well for early breeding.

Farmers who are able to make more cattle available in one way or another will give positive help to those who have lost their stock, without disturbing unduly the tempo of their own farming.

The Advisory Services are able and anxious to assist. If you think he can help, please contact your country or district adviser.

Hobby Farming

G. H. Camamile and E. S. Carter

FARMING has always attracted professional and businessmen who, for one reason or another, wish to establish a stake in the country. Many of these so-called hobby farmers have brought money and new ideas to farming; some have been successful, but others have incurred heavy losses. At one time such losses could be set-off against other income, but changes have been made in two stages which can affect the taxpayer who has a farm and another source of income.

'Hobby' businesses since 1960

In the Finance Act of 1960, new provisions were introduced aimed at preventing wealthy taxpayers from setting off losses incurred in non-commercial ventures against their other income for tax purposes, and obtaining repayments of income tax and relief from surtax. Although this legislation was admittedly intended to deal in the main with hobby farming, it did not mention this type of farming by name, consequently it applies to trades of every kind.

What the 1960 Finance Act had to say was that losses (and capital allowances) would not be allowed for relief under Section 341 Income Tax Act 1952 (as amended in 1953) (Section 58 (2) Finance Act 1965 for companies)—the sections which give the relief by set-off against other income—' . . . unless it is shown that the trade was being carried on for that year of assessment on a commercial basis and with a view to the realization of profits in the trade . . .'

Application in practice

In practice this test was found difficult to apply, particularly because the 1960 Act went on to say that ' . . . the fact that a trade was being carried on at any time so as to afford a reasonable expectation of profit shall be conclusive evidence that it was then being carried on with a view to the realization of profits'.

Consequently, it was felt that a further change was necessary, and in his budget statement last year the Chancellor proposed that, except in special circumstances, hobby farmers should no longer be able to set-off their losses against other income for more than five years running.

The new rule for 1967

The Finance Act 1967 implemented this by excluding from relief by way of set-off against total income any loss and related capital allowances, incurred in a trade of farming or market gardening, if in each of the previous five years a loss was incurred in carrying on that trade.

The first point to note is that this rule applies only to farming and market gardening—the rule in the 1960 Finance Act (which is not repealed) applies to all trades. The new legislation is therefore intended to apply a practical test of whether or not a farming venture is commercial, and in case the 'five year' rule catches any cases where abnormal considerations apply, there is a special relief provided.

The hypothetical farmer

In practice this relief is likely to be difficult for the taxpayer to take because it requires him to satisfy two tests which are as follows:

(*a*) that the nature and conduct of the whole of the farming, etc., activities must be such as to justify a reasonable expectation of profit in the future if they had been undertaken by a competent farmer, and

(*b*) that a competent farmer undertaking those activities at the beginning of the period of consecutive years for which losses have been made (which may well be more than 5 years) could not expect those activities to become profitable before the end of the year for which relief is claimed (not necessarily the end of the sixth year).

Losses defined

In working out the 'loss' for each of the five previous years, capital allowances (or depreciation) are not taken into account, so that in most genuine cases the change will not operate unfairly: if the trade has not been running for five years, there is no restriction of loss relief. A partnership change does not provide a fresh start for a partner or person who is engaged in farming or market gardening before and after the change but a new partner (not being husband or wife or company controlled by either or both) who has not previously farmed would not be deprived of relief for a five-year period even though the person or partnership which he joined was caught by the five-year test. Neither can a farmer escape the operation of the Section by transferring a loss-making trade to a company which he or his wife or both of them control.

Not retrospective

Finally, it should be clear that the new rule is not retrospective; it does not apply to restrict set-off for losses incurred in a year of assessment before 1967–68, in the case of individuals, and there is a corresponding rule for companies.

Conclusions

This change will not affect the majority of farmers: for those who are likely to fall within its boundaries, it is an incentive to make the venture in question profitable just as soon as they can. It is important to remember that neither the old nor the new rules on this prevent the carry forward of losses, even if they are not allowed for set-off in any year so that they may be relieved

against the first available profit of the trade made in the future. Capital expenditure on farm improvements and new buildings, which qualifies for agricultural buildings allowances under Section 314 of the Income Tax Act 1952 are in no way restricted either by Section 20 of the Finance Act 1960 or by Section 22 of the Finance Act 1967.

There is no doubt that as communications improve and the working week gets shorter more part-time or hobby farming will be carried on. There is no reason why such farming should not be profitable if the right advice is sought and the system of farming to suit the needs of the particular individual is practised. What is important is a proper appreciation of all the factors involved, technical, financial and managerial.

The Ministry's Publications

Since the list published in the December, 1967, issue of *Agriculture* (p. 598) the following publications have been issued.

MAJOR PUBLICATIONS

Bulletin No. 191. Business Control in Poultry Keeping (New) 16*s*. 6*d*. (by post 17*s*. 4*d*.)

Bulletin No. 197. Flowers from Bulbs and Corms (New) 12*s*. 6*d*. (by post 13*s*. 2*d*.)

Experimental Horticulture No. 17. (New) 8*s*. (by post 8*s*. 6*d*.)

Fixed Equipment of the Farm Leaflet No. 40. Wall Construction (Revised) 2*s*. 6*d*. (by post 2*s*. 11*d*.)

FREE ISSUES

ADVISORY LEAFLETS

No. 62. White Rot of Onions and Related Crops (Revised)

No. 106. Apple Aphids (Revised)

No. 115. Slugs and Snails (Revised)

No. 269. Cabbage Aphids (Revised)

No. 335. Rootstocks for Apples and Pears (Revised)

No. 442. Phosphatic Fertilizers for Farm Crops (Revised)

No. 480. Cannibalism and Feather Picking in Poultry (Revised)

No. 549. Langstroth and Modified Dadent (M.D.) Hives (New)

SHORT TERM LEAFLETS

No. 46. Seeds Mixtures (Revised)

No. 71. Irrigation Guide (New)

The priced publications are obtainable from Government Bookshops (address on p. 50) or through any bookseller. Unpriced items are obtainable only from the Ministry (Publications), Tolcarne Drive, Pinner, Middlesex.

Research Spot

Long Ashton Report

Sylvia Laverton

PLANT breeding has always had an important place in Long Ashton's research programme. Recent emphasis has been on soft fruit. A breeding programme designed to produce new high-yielding disease resistant varieties of black currant suitable for modern methods of cultivation and harvesting started in 1959, when inter-crosses were made with the old-established Baldwin, Boskoop Giant, Seabrook's Black and Victoria, to assess their potential value as parent varieties. A second series of inter-crosses made in 1962 extended this investigation to Amos Black, Wellington XXX and two varieties bred by George Spinks at Long Ashton in the 1930s—Malvern Cross and Mendip Cross.

All but three of the 1,500 seedlings selected for trial from the progenies of these crosses were infected by mildew in the severe outbreak that occurred in 1964. A new batch of 1,500 seedlings, bred from the three mildew-resistant selections, was planted out into fruiting positions in 1966. This collection was obtained by back-crossing to Baldwin and also by out-crossing to other sources of mildew resistance which have a more erect habit of growth. Their future progress will be followed with keen interest by growers. Meanwhile the mildew-resistant selections that emerged from the 1964 epidemic have maintained their promise, and are now planted out in a small-scale yield test, where they will be harvested both conventionally and by cutting down to stimulate mechanical harvesting. Several seedlings among the progeny obtained by crossing Victoria with Brodtorp have shown a high degree of field resistance to both mildew and leaf spot. Unfortunately harsh weather at flowering time in 1966 caused poor fruit set, so selection for fruiting characters has not yet been possible. For the same reason final assessments of the earlier series of seedlings, and of a more recent series bred from three very large fruited Russian varieties, have been deferred until 1967.

Mechanical harvesting of black currants

When mechanical harvesting was proposed for black currants and new cultural systems had to be explored, lack of knowledge about the physiological characters of different varieties of black currant made it impossible to predict which, if any, would be best for the new methods. Work now in progress at Long Ashton will help to fill the gap. Some basic data about vegetative

growth and flower bud differentiation in 14 black currant varieties* obtained in a preliminary one-year study is given in the 1966 report. One-year old bushes of the chosen varieties were planted, at 9 × 3 ft in October, 1964, and immediately cut back. Records of extension growth and flower initiation in the new shoots that developed during the following growing season showed many inter-varietal differences in potential yield; in the rate, amount and timing of vegetative growth; and in the time and site of flower initiation. These differences make it difficult to suggest characters on which to base selection of potential high-yielding seedlings for mechanical harvesting. Clearly, in any future system that involves cropping on one-year wood, it is important that the wood produced should carry as many flower buds as possible. This is not the only factor influencing yield—number of flowers per node, fruit set and fruit size must also be considered. Cotswold Cross and Malvern Cross, which would seem to have the greatest potential, have proved unsatisfactory for biennial cropping. Baldwin and Wellington XXX, which also showed up well, have been more successful. Of the others, Green's Black would seem worth trying.

Pollinator trees

In apple production, recent experience suggests that failure of fertilization through one cause or another may frequently limit cropping, particularly in the West Country. There is an established trend to reduce the number of varieties in a fruit plantation, and to substitute rows of pollinators for the scattered one-in-nine pollinator plant. Often, this has necessitated increasing the proportion of pollinator trees—one row in nine is generally insufficient—with a corresponding reduction in financial returns since the pollinator varieties usually command lower prices than those obtained for Cox's Orange Pippin. The pollination problem is being further accentuated by the increasing use of dwarf trees in rectangular or hedgerow systems, for these give an orchard environment different from that existing in a conventionally arranged plantation. Research workers at Rothamsted recently suggested that it may be necessary to plant a pollinator tree for every tree of the main variety grown, to ensure adequate pollination. Such a remedy would introduce other problems for the grower. Investigations are therefore being made at Long Ashton from which it is hoped to devise efficient pollinator systems which combine easy management with the maximum amount of fruiting wood of the main variety (Cox) in each orchard acre. One system is based on the use of pollinator grafts in many or all of the Cox trees. This is accepted practice in some fruit-growing countries and is not uncommon in English orchards. Usually a good pollen producer such as James Grieve is used. However, the system has several disadvantages. It may be impracticable to harvest the pollinator's fruit, particularly if it ripens before Cox. A heavy cropper such as James Grieve can act as a considerable drain on the cropping capacity of the Cox tree. And unless the pollinator branches are kept clearly labelled they may be pruned out accidentally, or allowed to become too large. These and other disadvantages of the pollinator-graft system may be overcome by the use of *Malus* species as pollinators. Since *Malus* spp. are sensitive to apple viruses they cannot be used in any existing orchards—the grafts would

*Green's Black, Baldwin, Amos Black, Blacksmith, Boskoop Giant, Laxton's Giant, Mendip Cross, Seabrook's Black, Westerwick Choice, Cotswold Cross, Raven, Malvern Cross, Wellington XXX and Tinker.

die or their growth and flowering would be severely impaired. However, the virus-tested propagating material now available worked on virus-tested rootstocks would be entirely suitable.

Preliminary experiments with three of the 50 *Malus* spp. in the Long Ashton collection—*M. aldenhamensis; M. floribunda* 'Hillierii'; and Red Tip Crab (*M. ioensis* × *pumila Niedzwetzkyana* Rehd.)—suggest that the first two are worthy of field trials as pollinators in orchards planted wholly with Cox's Orange Pippin. Other *Malus* spp. will also be examined both for use with Cox and as graft-pollinators for other commercial apples that flower at a different time from Cox. It may eventually be possible to select a range of cultivars from this species to cover the entire flowering season for our dessert apple varieties.

Other aspects of pollination being studied at Long Ashton include methods of pollen transfer and factors influencing the effective distance of pollinator trees. In experiments in which trees of Cox's Orange Pippin, growing in pots, were placed in cages of different mesh size, observations made in 1964–66 suggest that insects are the main agents of pollen transfer and that large ones (flies as well as hive bees and wild bees) are more effective than small ones. In all three years the level of insect activity was adequate to effect cross pollination in the absence of wind. Measurements showed that the amount of pollen carried by the wind decreased rapidly with distance, more than half being lost within 50 yards of the source. Calculations showed that a relatively short period of insect activity when blossom is plentiful can be sufficient to give a commercial crop in an apple plantation. This indicates that reasons other than lack of pollinating insects may predominate when flowers fail to produce fruit. The 1966 observations suggest that relevant factors which may have been underestimated in the past include the effective pollination period, the levels of male and female sterility, pollen compatability and the relationship between pollen and insect population gradients. Unseasonable weather in April, 1966, restricted fruit set in pears because of pollen sterility, and in apples through reduced ovule longevity and sterility, both of which reduced the efficiency of pollinating agents, whether bees, indigenous insects or wind.

Virus-tested material

Work with virus-tested material continued in 1966 with the establishment of a stoolbed of the following newly heat-treated, virus-tested rootstock clones: M I, M II, M VII, M IX, MM 109, together with others previously tested: M 26, MM 104, MM 106 and M 111. The demand from commercial nurserymen and growers for heat-treated budwood continued at the same level as in 1965, 50,000 buds being dispatched during July and August. The formation of a Nuclear Stock Scheme for virus-tested apples and pears is expected to increase demand still further.

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Aerial photography and Land Use planning

V. C. Robertson

In this country our use of land has evolved gradually over a long period and has settled down into what is, in general, an overall pattern fairly compatable with proper use of resources. There are a few rather major exceptions, such as in the Highlands of Scotland where a locally evolved system of land use was broken up by external influences with serious long-term effects. There are, of course, many instances where land utilization could be improved or where choices of land use (particularly between urban, industrial and agricultural use) do not seem to be made on a considered basis of optimum use of resources. Furthermore, agricultural use of land in Britain is greatly influenced by government policy in the matter of crop or livestock prices and by subsidies. But the broad generalization remains: land use seems reasonably well related to natural resources, though perhaps one might add that positive information about our natural resources is not quite so complete as could be expected in a relatively small and highly developed country.

Developing countries

In the under-developed or developing countries of the world, this is rarely the situation. Rapidly expanding populations have forced people into lands less well-suited to agriculture, or have rendered harmful what were, under conditions of low population density, perfectly reasonable practices. The often condemned system of shifting cultivation is one of these: for example, on relatively poor soils in the 'dry' zone forests of Ceylon or the

Savanna belt of Africa, a sufficient period of regeneration between 'shifts' was allowed—until increased population telescoped the cycle and impoverishment or erosion of resources set in. It is in the developing countries where land use planning on a large scale is most urgent, and here, too, where the aerial photograph is a particularly valuable tool in the planners' hands.

The proper planning of land use should allow for sustained production while conserving and, if possible, building up the vital natural resources. In many countries the problem is to move from purely exploitive forms of land use to conservation farming on a sustained yield basis, or to develop land so far unused on a sound basis—in both cases moving on to increasingly highly productive management wherever conditions for this are possible. In planning, there are essentially three main stages to go through. First, there is the fact-finding stage when data on available resources is collected; then the analysis stage when this information is translated into assessment of 'capability'—demonstrating the range of uses compatable with the resources being examined; and the final choice of approach, where capability is refined via assessment of economic and social considerations. It is in the first two stages, and particularly in the fact-finding operation, that aerial photographs are most valuable.

The vertical photograph

The aerial photograph—and in the present context this is the vertical photograph, showing the ground surface directly from above—provides not only a highly detailed picture of the surface but, because aerial photographs can be taken at intervals along the flight line of the aircraft so that each overlaps the next, each contiguous pair can be viewed stereoscopically to show relief, different heights of vegetation and so on. The scale of photograph, a function both of flying height and of the focal length of the camera lens, can be varied to suit different purposes: from large-scale photographs detailed enough to identify particular crops to small-scale cover suitable for regional development planning. With recent improvements in colour printing processes, it is now possible to choose from a very wide range of films (expanded by use of selective light filters) so that the right film/filter/scale combination best to tackle a particular problem can be selected. Panchromatic (black-and-white) photography remains the most common and economical in use. Infra-red has special uses, for example, in certain types of vegetation differentiation and in showing differences in moisture status of soils; but it is colour photography which offers the greatest amount of additional information in air photo-analysis, particularly in work involving natural resource identification and evaluation.

Natural colour photography is perhaps likely to be of greatest use to a land use planner. Quality is now extremely high. Moreover, in the printing process, colour values can be controlled to ensure matching between batches of photographs, and this is very important where some critical feature has a key colour relationship; in addition, the colour balance can be altered to bring out special aspects. 'False' colour (in which three layers of emulsion are sensitized to green, red and infra-red), which produces pictures largely in tones of magenta and cyan-blue, has its special uses: for example, dying or diseased foliage appears grey-blue in contrast to magenta or pink healthy leaves and, like normal infra-red, false colour shows up moisture differences more strikingly.

Difficulties—and advantages

In spite of the knowledge that now exists about photographic materials and suitable scales for interpretation, it remains surprisingly difficult to obtain properly planned photography tailored for the job in hand. In land use work, a further complication is season of the year: this can be critical in making full use of photographs in soil survey, where soil differences may be much more apparent at the close of a rainy season, either directly because of differences in absorptive capacity and soil colour or indirectly because of differential growth of vegetation. In areas already utilized by man, where the problem is less one of planning initial development but of rehabilitation and improvement of an existing situation, the aerial photograph can be invaluable in preparing a rapid inventory of present usage—and here again season of the year may be crucial in obtaining photographs when the bulk of the crops are visible or when preparation of the land for crops is identifiable.

The great advantages of the aerial photograph are firstly, that used intelligently by the man in the field (and preferably before he goes into the field), a much better and more accurate picture of natural resources and present use can be obtained than by field studies alone; and secondly, they will normally offer a tremendous saving in time, and therefore cost. This applies particularly in large-scale investigations, but remains surprisingly so even in smaller and more detailed operations. But to gain full value from photographs it is necessary to understand fully their uses and limitations, the techniques of stereoscopic analysis, and to be able to plan scale, film and season to exploit the conditions to be examined.

A reconnaissance study

Some years ago we were invited to undertake the first stage of a development study covering about 12,000 square miles in Western Sudan. The Government wanted an initial assessment of the possibility of improving agriculture with irrigated farming in a remote area with a highly seasonal rainfall. Special photography, at the small scale of 1/40,000, suitable for such a reconnaissance study, was flown by the Government's survey unit, at the end of the rainy season as requested. Only the sketchiest of maps existed. These photographs were examined stereoscopically in the office, by a team of specialists, and the results were plotted on to mosaics (photo-maps built up from the individual prints) covering the whole project area. From this exercise we plotted the areas which appeared to contain reasonably deep soils (much of the area consisted of rocky country with poor shallow soils), the different types of tree cover, the complete river and stream pattern, potential dam and reservoir sites, and the main geological structures. This took about three months, and it immediately focussed our attention on the areas worthy of detailed study and eliminated the apparently useless country (which of course would be checked later on the ground). We were then able to field a highly mobile team, equipped with a helicopter, and get down to the serious business of checking, verifying, and analyzing the results of the photographic study. Including the period after the field operation—preparing the final report, soil maps, geological maps, vegetation maps, plus plans of all the dam sites surveyed in detail on the ground—the whole

operation was completed in under a year, and provided a fairly classic example of the value of aerial photography in a large-scale operation of this type.

Assessing land capability

This Sudan survey, of course, was also an example of the first stage in land use planning—the preparation of a picture of the natural resources in a largely undeveloped area, giving only broad indications of future usage but pinpointing the areas to concentrate on. In West Pakistan, aerial photographs, this time at 1/25,000 scale, were used in a watershed management study of a major reservoir catchment: a study which involved not only a survey of present land use but an assessment of land capability and the design of conservation measures to reduce siltation of the Mangla reservoir, which is a vital storage reservoir in the vast Indus Basin programme. Much of this country, at the western end of the Himalayas, is very broken and inaccessible, and a complete picture of land use in the catchment would have taken years to complete by ground methods alone. A photo-interpretation key was built up after analysing land use patterns on the aerial photographs and visiting sample areas on the ground. A geological analysis was also made, similarly checked on the ground, from which an assessment of erosion hazard could be made for different rock types and land forms. A team including an ecologist, geologist, soil surveyor and economist, then built up a land capability system which was applied to the air photos of the catchment. In this project, the team were resident full time in Pakistan, making corroborative field checks much easier. The whole study, covering an area of 3,000 square miles in detail, involving, as well as present land use and land capability maps, the selection and detailed planning of fourteen demonstration conservation sites in different types of terrain, took eighteen months—with a reconnaissance study of a further 3,000 square miles undertaken at the same time.

Future use

In Britain, the current emphasis on regional planning may well direct more attention to the uses of aerial photography, especially colour. The Soil Survey of England and Wales, and the Soil Survey of Scotland, are using aerial photography on an increasing scale, both in the actual work of survey and as a basis for presenting results. In the Highlands of Scotland, where, unfortunately, weather conditions are none too favourable for its acquisition, there seems also a considerable role for aerial photography to play in land use planning: and in detail, there is a good deal to be gained from its use on individual farms. A lot of excellent recent medium scale cover is available in Britain, especially for such counties where County Councils have commissioned complete coverage, which is then usable by all concerned with development planning. So far comparatively little colour photography has been commissioned, but the use of this will obviously increase.

This article has been contributed by **V. C. Robertson, M.A., B.Sc. (Agric.), Dip. Agric. (Cantab.)**, who is general manager of Hunting Technical Services Ltd.

Farming Cameo: Series 4

7. Cardiganshire

Harry T. Shaw

THE southern half of the county and the coastal strip comprises the bulk of the county's 244,000 acres of crops and grass, 22,000 of which are arable crops, just over half being barley. Essentially it is a dairying area from which most of the 28,000,000 gallons of milk sold last year were produced. The main stock rearing and sheep area covers 137,500 acres. Most of this is in the north and east of the county. The northern boundary of the county is the river Dyfi and the southern, is the famous salmon river, the Teifi.

Many farmers in the county have realized that, with present economic trends, intensification and simplification is the only solution for the future. Especially is this so in the lowland areas. One coastal belt farmer, with this economic picture very much in mind is, Mr. D. J. Davies, Panteryrod, Llwyncelyn; known throughout the county and beyond as 'D.J., Panteryrod'.

Mr. Davies is energetic of mind and body. His lively, forward-looking mind keenly interprets his observations and then he applies his energy to putting into practice that which he considers will produce the most profit under the conditions ruling at the time. His interest is *profit per acre*, not output per acre. To him, farming is a very serious business, and not a 'way of life'. D.J. is a flexible person. Each year that flexibility is demonstrated as he adopts new techniques and applies new knowledge to his system. His farming pattern changes, as he appreciates more, the potentiality of the land and the capabilities of the animal.

Initially, his dairy feeding system was based on high-quality silage feeding in winter, supplemented with bought concentrate feeding all through the year. Subsequently, this policy gave way to the making of larger quantities of medium quality silage coupled with no concentrate feeding whilst the cows were out on grass. Latterly, the introduction of moist grain storage has meant that the bought concentrates have been replaced by home-grown mixed corn, balanced with protein and minerals. Silage has been eliminated; instead, straw and the home-grown cereal mix is fed.

Two years ago it was D.J.'s intention to introduce a barley-beef enterprise. A 90 × 60 ft building with earth floor and central automatic feeder was erected. In the meantime he decided that barley beef was too risky and last winter, as a trial, he accommodated 60 dairy cows in the building. These were bedded on straw and fed a straw-balanced moist cereal feed. He compared their performance with 100 dairy cows on his self-feed silage-balanced moist cereal feed system. The 60 cows showed more profit per cow (bedding straw costed), better quality milk, no slurry problem, no mastitis and cleaner cows, when compared with the silage fed herd, with its serious slurry problem and incidence of mastitis. The outcome is, that during the coming winter the entire herd will be bedded on straw and fed straw and balanced cereal.

The herd comprises 220 Friesians (1,100 gallons average). Four Hereford bulls run with the cows, except for a six-week period, during October-November, so as to avoid July-August calvings. All calves are sold at two weeks old. Cows are bought in as third calvers and kept for, on average, another six lactations. All the year round the herd is out by day but housed by night from late November to early March.

The grassland policy aims at producing a sequence of fresh, fast growing grass in paddocks. This has led to hypomagnesaemia trouble in the past. To overcome this problem, 1 lb per milking of a high magnesium-mineralized cereal nut is fed to each cow, during the period March-November, in the sixteen abreast twin pipeline parlour. The winter feeding, December-March, is now fully automated. The cereal (80 per cent barley, 20 per cent oats) is augered from the 210 ton capacity moist grain silo through a crimper on to the conveyor-belt feeder. A mineralized protein balanced meal is also metered on to the conveyor belt at the rate of 1 lb per 6 lb of cereals. This mixture is fed at 4 lb per gallon for every gallon produced during the winter feeding period. In addition, each cow is fed 10 lb straw. Straw balancer nuts fed at the rate of 1 lb per milking, are fed in the parlour.

Panteryrod, originally 100 acres, is a coastal farm 300 ft above sea level and situated in an area of 35 in. rainfall and mild winters. When Mr. Davies bought the farm in 1945, the acreage, as a result of amalgamations, had increased to 275 acres. Adjoining holdings have since been purchased. Today, Panteryrod, created from nine original holdings, is a compact 480 acres in a ring fence (60 acres being scrub and cliff).

The cropping is 230 acres of grass and 200 acres of corn for 220 Friesian dairy cows and the labour employed, two men and one boy. The corn land receives the yard manure in early March. This policy dictates the amount of combined compound manure used in the seedbed.

It is an area naturally low in lime and phosphate; ground limestone is applied on the basis of soil analysis. The grassland is slagged every other autumn, heavy dressings of complete fertilizer and straight nitrogen are used, supplying per acre, per year, approximately:

Units	N	P	K
Grazed area	340	150	80
Conserved area	350	150	120

Mr. Davies' observations on his system are:

1. Straw fed and straw bedded cows are the answer.
2. Surplus grass conserved as hay, rather than silage, gives a saleable product (1,000 tons of silage per year used to be made).
3. Over 30 cwt of grain and approximately 30 cwt of straw per acre is produced, giving a saleable surplus of 12–15 cwt grain and 5 cwt straw per acre.
4. Handling a large herd has its drawbacks. Individual rationing cannot be carried out. Further, 200 cows can play havoc with gateways and can be an annoyance to motorists.
5. More nitrogen would produce more grass and 150 units of potash are essential.

Mr. Davies considers 0·6 acres of grass, on a paddock system, is sufficient per cow when conservation is not practised. Also, 0·6 acres of corn producing 18 cwt grain and 15 cwt straw is sufficient for one cow. On this basis, he maintains that his ultimate aim of 350 dairy cows on 420 acres of grass and corn is feasible. When this has been achieved 'D. J. Panteryrod' will undoubtedly by the 'Dairy Farming Tycoon of Cardiganshire'.

FROM THE ALS

This article discusses the effects and economics of hedge removal on farms

Hedge Removal

E. G. Scruton *Agricultural Land Service, Exeter*

A GREAT many miles of hedges were established in the English countryside during the eighteenth and nineteenth centuries. This was in the era of the great enclosures, although in the south-eastern area of the country, in particular, hedges date back to Saxon times. Modern trends and economic pressures in recent years have rendered the removal of some hedges necessary and examples of the craftsmanship of hedge laying, in which great pride was taken by the men who carried out this work, are becoming less frequent.

Inevitably there are disadvantages as well as advantages in hedge removal, and this results in two quite opposed schools of thought. These may be summarized as follows:

Disadvantages

Loss of Shelter. A good hedge provides shelter for livestock in those areas where it will thrive during the temperature extremes which are experienced in this country. This is likely to affect the liveweight gains in fattening stock and the yields in dairy cattle, although to a certain degree this is now counteracted by the fact that a considerable proportion of stock are housed in buildings during the winter months. Sheep are generally an exception to this.

Drainage. The removal of hedges will often cause drainage problems, particularly if the elimination of ditches is involved. On sloping land where the existence of a hedge protects the lower fields from excess water, and also reduces runoff, removal could lead to flooding by over-loading the watercourses.

Soil erosion. Hedges prevent the erosion of soil, both by acting as a windbreak and against the action of the water.

Effect of wild life. Hedges provide nesting sites for a great variety of wild life. While removal might reduce bird pests it should not be overlooked that hedges also shelter game, which could provide a source of pleasure and profit for the farmer.

Amenity. In the opinion of many people the wholesale removal of hedges and banks would adversely affect the character and scenic value of the countryside.

Revenue. Hedges may provide a limited source of revenue by the sale of hedgerow timber and can even provide fencing stakes and other timber requirements for use on the farm.

Advantages

Maintenance. On the majority of holdings the laying and maintenance of hedges entails considerable expense, especially if the work is to be efficiently carried out. It also becomes increasingly difficult as the drift of labour from the land continues. To some extent, this is now offset by the use of modern machinery.

Pests and weeds. Hedges, especially those that are overgrown and badly maintained, harbour vermin which can and do cause considerable crop damage. They also provide a habitat for some weeds although modern spraying methods are now eliminating this problem.

Shading. In a field bounded by high hedges, the shading which results can lead to an appreciable loss of crop. This is particularly the case where the hedge contains numerous hedge timbers but, of course, these can be removed.

Flexibility. The removal of hedges and banks affords greater flexibility of enterprise, therefore, farming policies can be altered with greater ease.

Increased workable acreage. The removal of 55 chains of a hedge six foot wide, together with six foot of adjacent headland and side land, i.e., three feet each side, could give a total of one acre of extra land for cropping or grazing.

Inevitably the question of economics will loom large when considering whether or not to remove a hedge. Obviously the costs involved will vary with the site, but against this can be set the time and labour saved in its continued maintenance. The grant which may be available in some cases towards the capital cost of removal and possible appreciation in the market value of land itself should also be taken into account. The main consideration, however, may well be the opportunity that removal provides to re-shape and enlarge fields so that better use can be made of modern farm machinery, with consequent saving of much non-productive work involved in small irregular shaped fields. This may not only lead to better cropping facilities on corn-growing farms, but may also provide larger areas of grassland on dairy and stock farms which, with the use of temporary fences, is an aid to successful grazing.

To sum up, therefore, as long as the advantages of banks and hedges, as well as ditches required for drainage purposes, are not overlooked, there can be no doubt that in many cases it may be sound practice to remove hedges to provide a field pattern compatible with modern farming practice.

in brief

- **Meat research**
- **Sweden's dairy computer**
- **Silage and straw**

Meat research

THE establishment under the aegis of the A.R.C. of the new Meat Research Institute on the experimental farm of the Veterinary Department of Bristol University at Langford is an important development in meat production and marketing to consumer preference standards. An advisory committee which includes representatives of various sections of the meat trade from producers to consumers will guide the programme of research by an experienced staff of 75 under the Director, Dr. M. Ingram.

The basic aim is to ensure that improvements in the production and quality of meat go hand in hand, and thus, to quote Dr. Ingram, the first important activity of the Institute will be to examine the effect of new methods of production on the *quality* of meat; e.g., the introductions of new breeds and crosses like Charolais cattle for beef, the Pietrain pig, or growth promotion by hormone injection.

Better ways of estimating (by photogrammetry and ultrasonic soundings) both the quantity and quality of meat before the animals are put on the hook should have an obvious effect on breeding for herd improvement. Important, too, are the methods of collecting and transporting live animals, which have a marked commercial influence on many properties in the finished joints and cuts that end up in the housewife's shopping basket.

Slaughter procedures will also be investigated by the new Institute: for example, whether carcasses are bled and dressed hanging instead of prone so that they retain less blood, whether the spraying of carcasses with water instead of using wiping cloths has an adverse effect on appearance and keeping quality, what the optimum temperature of cutting rooms should be. Such investigations may well lead to changes in the layout and equipment of slaughterhouses.

The carriage and distribution of the finished meat, especially improvements in refrigeration, are also likely to be important features of the Institute's research programme. The prepackaging of meat at some central point could revolutionize the distribution trade if certain fundamental problems connected with hygiene and the interchange of gases between the meat and the nature of the packaging material can be solved.

These and a host of other related fields of inquiry will keep the Institute busy for years to come. Dr. Ingram agrees that research of this kind is expensive and its ultimate value hard to foretell, thus a *national* institute seems to be particularly appropriate.

The qualities of meat which the consumer looks for are colour, tenderness and flavour. They start with the farmer and can be affected for good or ill by any of the methods of subsequent handling. The Meat Institute's job is to show the way to the best possible product that can be offered.

Sweden's dairy computer

ELECTRONIC data processing for the improvement of dairy herds is showing worthwhile results in Sweden, where the production of milk and meat by dairy cows constitutes the most important source of income for farmers. The national dairy herd of Sweden is around 900,000, and of these 70 per cent are artificially inseminated. Forty per cent are enrolled in milk recording associations.

Basic data on A.I. and milk production, which is collected on farm visits by A.I. staff and veterinary officers, are fed into a computer by the Co-operative Svensk Husdjursskotel (SHS), to which all A.I., milk recording and breed societies are joined. Thus an electronic eye is kept on the fertility of bulls standing at the 14 studs, and, by disclosing the rate of non-return after 28, 56 and 273 days, scrutinizes the effectiveness of each bull. This covers both frozen and fresh liquid semen. The competence of the A.I. technicians is also watched through the computer-processed records, so that the human factor in the skill of artificial insemination can likewise be controlled.

These records also facilitate progeny testing of A.I. bulls, which as a by-product produce data on fertility, etc. of various breeds and breed crosses. Since the A.I. field staff is paid partly according to the amount of work done, the computer also helps in assessing their monthly salaries. In the same way a complete calculation is made of fees due from members of the local associations, and bills are sent to each of these farmers in the name of the association of which he is a member.

Another by-product of data processing is information that can be utilized in making forecasts of milk and meat production. By observing the number of cows slaughtered and the number of heifers that calve, it is possible to keep abreast of the exact population of dairy cows. Information about the number of animals inseminated also helps to indicate how large the total production of milk in the country will be after calving. The Swedish milk marketing organization has recognized the value of this in its planning by paying from a special fund about one-third of the total cost of the milk recording service.

A system for computer calculation of feeding plans is now being introduced. The farmer reports what basic feed he is using (i.e. the amounts of roughage per cow) and the computer then calculates the amount of concentrates that should be fed to each cow according to daily milk yield, lactation stage, body weight, etc. These feeding instructions are supplied monthly. Because A.I. data and milk records are processed by the same computer, information is easily transferred from one system to the other. Records of inseminations made in A.I. work are used to determine the sires of calves born to cows in milk-recorded herds.

The high standard of milk production in Sweden is seen from the fact that the annual average yield of milk for recorded cows in 1966 was 10,860 lb, with 4·15 per cent butter fat—the highest yield among recorded dairy cow populations in Europe.

(Digest of article in *Fatis Review* No. 3,1967)

Silage and straw

CONSERVING grass must be done relatively cheaply and the final product must be good enough to form part of the production ration. So said Professor J. C. Murdoch of Queen's University, Belfast, speaking to the Lincolnshire Grassland Society recently. Silage costing £3–£3 10*s*. a ton to make and then found to be capable of producing only maintenance is much too expensive. To show any advantage over a straw-concentrate ration, conserved grass must be of a standard to produce milk and replace concentrates. If as much care were to be given to the making of silage as is devoted to arable crops, said Professor Murdoch, there would be no cause to worry.

AGRIC

Books

Garner's Veterinary Toxicology. (3rd Edition). Revised by E. G. Clarke and Myra Clarke. Baillière Tindall and Cassell, 1967. 60*s*.

Veterinary toxicology is a comprehensive subject today, and to keep this book up-to-date four authors have contributed to its revision. The book now has eight parts, an introduction; a section on mineral or inorganic substances; three parts dealing with organic substances which include drugs and pesticides; a part each for poisonous plants and radioactive materials; and a new chapter on venomous bites and stings and doping.

In general the common toxic conditions of animals in the British Isles are dealt with very well. A description of the sources of toxicity and symptoms together with changes *post-mortem*, diagnosis and treatment give a toxicological treatise for topics such as lead poisoning, ragwort poisoning, etc. It is evident, therefore, that this book must have high priority for reference by veterinary surgeons, agriculturists and students of these schools. Its use by the research worker is limited, although it should not be discounted for being too broad in its scope; a glance at the pages on aflatoxicosis, for example, illustrates the detail with which the authors may deal.

This edition replaces that of 1961, and the parts on radioactive materials and pesticides have been substantially revised and thereby improved. The former part, revised by Garner, is much more readable and presents the hazards of radioactivity in a refined manner. The latter on pesticides has been revised by Papworth, and the additions to this section are necessary in this expanding aspect of toxicology. An important omission, however, is that the author does not always suggest the possible source of toxic material to the domestic animal. Many of the organophosphorus insecticides currently used for crop-protection, although included in the list, are not described as having this use; yet it is this type of unintentional contact between the animal and insecticide which produces many of the cases of pesticide poisoning. Nevertheless, these two chapters are impressive as a result of their freshness.

The section on poisonous plants has also been improved by its rearrangement although it contains little additional material. The families of the whole plant kingdom have now been listed alphabetically which gives the chapter a neat appearance, but, as the index is probably the key to this chapter, for many of us this revision is more aesthetic than practical. Like this chapter most of the others contain little new material except the two mentioned earlier. It is also a disappointment to find that some of the safer drugs in common use have not been included. For example, haloxon, thiabendazole and fluothane, to name just three, should at least find a place in this book in preference to many other drugs which to most readers are only obscure.

This book does not make easy reading, but it contains a vast store of information which, together with the bibliography, is invaluable for reference. The index is also to its credit as the specific toxicity of almost any agent can be referred to rapidly. This third edition is worth having; it could have almost constant use.

P.H.A.

Animal Health and Housing. David Sainsbury. Baillière, Tindall, and Cassell, 1967. 50*s*.

The well-known clear, comprehensive and practical approach of David Sainsbury is evident throughout this book. It is most readable: alternative methods and systems of housing are clearly enumerated, and the numerous illustrations and plans clarify and add detail in an admirable way. It will be most valuable to agricultural and veterinary students and agricultural advisers requiring comprehensive knowledge, but it can also be strongly recommended to the practical farmer seeking new ideas and detailed information. Occasionally, more critical comparisons in the *Which*? style (not unknown to this author) would have been welcome. For example, the pros and cons of different methods of cow identification might have received this treatment and the factors which govern the width of sow stalls might have been more fully discussed.

The turkey grower and the sheep farmer

will be disappointed at the lack of information on these species. In particular the housing of 'in lamb' ewes receives no mention but is surely a technique already with us and one which is likely to develop.

Obviously, and correctly, personal views have crept in and one detects a preference for 'thermal insulation' to 'deep straw'! Again one feels that the remarkably successful 'sweat box system' is not favoured, although the subject is discreetly discussed under the heading 'High Temperature High Humidity Housing'. Their 4-in. concrete roofs are referred to as entirely uninsulated and no mention is made of the simple thermostatic ventilation control which can be made to operate the stable doors. A list of the vital points essential for the successful working of this highly specialized system would have been more advantageous.

A great virtue of the book is its emphasis on function and working procedures which inevitably means better production and disease control. It might more correctly have been titled 'Housing in Relation to Animal Health', for the accent is rightly on prevention and little consideration is given to specific disease or preventative medication. In fact, a chapter on State Veterinary Medicine seems to be largely out of place. Significantly the stockman is not forgotten and page 5 includes the ground plan of a three bedroom bungalow suitable for his needs.

Undoubtedly, this book will have a long and useful life and the numerous references to systems used abroad should ensure that it also has success in the international field.

A.J.S.

Soviet and East European Agriculture. Edited by JERZY F. KARCZ. Cambridge University Press (Agents for University of California Press), 1967. 80*s*.

This book consists of papers given at a Conference on Soviet Agricultural Affairs held in California in August, 1965. Some 80 per cent of it is concerned with Russia, the remainder dealing briefly with Jugoslavian, Czechoslovakian and Polish agriculture. Most of the contributors are American; Professor Nove of Glasgow University who writes on 'Peasants and Officials' has provided one of the few easily readable and interesting chapters. It is strange that the subjects of corn (maize) and sugar beet should have been allotted to geographers and Jugoslavia to an anthropologist.

Anyone turning to this book for an introduction to Soviet agriculture is going to be grievously disappointed. Considerable knowledge of the set-up of socialized agriculture is assumed. There are numerous statistics and tables but there is a woeful lack of maps—some thirty pages on the regionalization of agriculture contain no map at all.

The curious thing about Russian agriculture is that it seems always to be about to improve. Reforms of administration and new ideas on organization are going to remove the brake; but the forward leap does not eventuate. What is lacking is incentive. A collective farmer can earn twice as much by a day's work on his private plot as he can working on the farm itself; these private plots, occupying some 4 per cent of the farmed area, provide over 30 per cent of total agricultural production. New ideas are imposed on too grandiose a scale; for instance, in the boost for corn or in trying to bring into cultivation the vast areas of Kazakhstan. Thinking has been short-term, concentrating on immediate increase of production, regardless of long-term effects; here in Britain it might be salutary to ponder this. Repeated efforts have been made to liberalize Soviet agriculture with more local autonomy and less rigid procurements at better prices. In time there are bound to be big changes in these directions, but a collective chairman has a tough job to attain reasonable efficiency when he must offer work to anyone in his farm area, although he has already, by any standard, a tremendous super abundance of labour.

Russian farms are too big and this seems to be at the heart of the trouble. Decision-making is on too large a scale, and workers have little real say in planning and hence little interest in the farm as a whole. The chairman of a collective may be unknown to many of his members and rarely visits outlying hamlets. Inputs (except labour!) allocated to Russian agriculture may have been too restricted, but progress in the last twenty years should have been better; it is significant that a much higher rate has been achieved in Poland since 1956 when nearly all the collectives were broken up and the land reverted to individual farmers.

This book is not light reading, nor is it a handy work of reference. No doubt any relevant statistic can be found at least once in its pages, but the figures are used to bolster up what appears, almost throughout, to be the aim and object—to prove that there is no good thing in Russian agriculture.

H.G.S.

The Horse: Structure and Movement. R. H. SMYTHE. J. A. Allen, 1967. 35*s*.

Written by a qualified veterinary surgeon, with a lifetime's experience amongst horses, this is an authoritative book and deals exhaustively with the framework and mechanism of the horse. The book will be a valuable aid to breeders, trainers and exhibitors, and to those who judge, work and ride horses for pleasure and for gain. The horse, having passed through a long period of evolution, has been described as man's staunchest friend and treasure. As mentioned it is unfortunate but true that active research into equine matters on truly scientific lines only commenced at a time when the horse was in danger of becoming extinct. The horse has long been notoriously controversial as regards the various contours of the body and also what constituted good or bad conformation, particularly when related to performance. The author has strong views in this connection and demonstrates to the reader exceptional understanding and knowledge of the physiology and dynamics of the horse. It is written, as one would expect, in equestrian vocabulary tempered by the veterinarian, primarily for the layman rather than the veterinary surgeon, although the latter will find a great deal of interest throughout the book and in particular in the sections dealing with movement and conformation.

There are four sections rather than chapters, each section being fairly complete in itself. The first, dealing with the skeleton of the horse, contains considerable detail on bone formation and the relationship of the horse's bones to the surface characteristics of the animal. Relationships of bones to external appearance are outlined together with the hereditary and occupational defects likely to arise from malformation of the numerous bones, joints and feet. Surface features are dealt with in part two and here, understandably, there is frequent reference to the previous section and the variations in the surface of a horse's body and the practical and economic eventualities. Further sections and an appendix give an excellent account of the movement of the horse and the mechanism which propels the body and the author's views on what constitutes good and bad conformation.

The illustrations are in the main diagrammatic and of exceptional clarity, designed to convey to the reader's mind some idea of the nature and relationships of parts of the body engaged in various gaits, particularly in relation to galloping and jumping.

In attempting to get readers to acquire the necessary understanding of the horse and its behaviour the author has closely considered its mechanical features and the problems it has to encounter to achieve its many tasks for humanity.

This is a first-rate book and contains much original matter to assist those who work with horses in the prevention and diagnosis of disease. It does not, however, provide much assistance in curative treatment and in this connection qualified veterinary advice is presumably still considered an essential.

S.A.C.O.

The Soils of the Preston District of Lancashire. (Memoirs of the Soil Survey of Great Britain) E. CROMPTON.

This memoir is a welcome addition to the published information on English soils, especially as it is the first one to appear which deals with an area in the North of England. Although the survey work was completed more than ten years ago there has been considerable delay in publishing both map and memoir largely due to the untimely death of Edward Crompton under whose direction the field work was carried out.

Most of the memoir is taken up with a discussion of the factors which have influenced soil formation in the area, geology, climate, relief and agriculture together with detailed descriptions of the forty soil types recognized for mapping purposes. The discussion on soil-forming factors is a wide ranging and deep one which reflects the interest of Crompton and his co-workers in the area in this aspect of soils and their desire to fully understand and interpret the soils which they saw and described in the field. The restriction of the account of the agriculture past and present of the area to a short chapter is to be welcomed, since information of this kind is not always entirely relevant to an account of the soils of an area and can often be found in more detail elsewhere. An addition which might be followed in memoirs for other areas is the inclusion of reports on special studies of the soils, in this case the mineralogy of the drifts from which many of the soils were derived, carried out simultaneously with the field mapping. Such studies can help in obtaining an understanding of the origin or agricultural characteristics of the soils described and provide valuable supplementary material to the usual visual descriptions and chemical and physical analyses.

The area covered by this memoir lies across the Lancashire landscape so that it includes a big proportion of the soils likely to be found in the county from the 'mosses' of the coastal plain up to the Pennine Moors. The material included on the factors which have resulted in the present soil pattern in particular, apply to much of the county. With its aid it should be possible to identify soils found in other areas and pending the publication of further memoirs will be extremely valuable to all, farmers, advisers and students interested in Lancashire soils.

Copies may be obtained from the Librarian, Rothamsted Experimental Station, Harpenden, Herts. Price 25*s.*

J.W.

Books Received

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Lecturers in either Agricultural Science, Agricultural Mechanics, or Farm Management are required to teach at the Jimma and Ambo Agricultural Schools.

Candidates must have an appropriate university degree with practical and teaching experience in their subjects.

Salaries £1,760 to £2,700 a year, subject to British income tax, plus variable non-taxable overseas allowances of either £625 single, £1,020 married unaccompanied, or £1,275 married accompanied, a year. Three years' contract.

SARAWAK

Agricultural Economist

RC 213/155/03

Duties: To take charge of an Agricultural Economics and Statistical Organisation; to undertake surveys and census on agricultural crops and communities; to conduct marketing investigations as well as the collection and interpretation of statistical information on crops, markets, etc. and also cost benefit analysis of Land Development Schemes.

Qualifications and Terms: An Honours degree in Economics with a Diploma in Agricultural Economics (Oxon) or equivalent which must include training in Agricultural Statistics. Post-graduate experience in agricultural survey work and agricultural marketing desirable. Basic salary $9,000—17,040 a year (£ (sterling) 1,226—2,322 a year). An inducement allowance at present in the range of £ (sterling) 739—1,206 a year is also payable. Terminal gratuity approximately 20% of basic salary and inducement allowance. 24-36 months' contract.

OFFICIAL APPOINTMENTS

JAMAICA

Agricultural Economist

RC 213/92/04

Duties: To advise and undertake studies in farm planning and land-use and to conduct a programme of investigation into the economic organisation of farms.

Qualifications and terms: A degree in Agricultural Economics with experience in the preparation of feasibility studies, cost/benefit analysis and farm management research.

Salary £2,500 to £3,250 a year, subject to British income tax, plus a variable tax-free overseas allowance currently ranging from £680 to £1,465 depending on marital status. One year contract.

MALAWI

Planning Officer

RC 213/134/011

Duties: To analyse and possibly prepare development projects in the field of Natural Resources and be largely responsible for their presentation in a form suitable for attracting finance.

Qualifications and Terms: a good degree in Economics, preferably Agricultural Economics. A knowledge of linear programming, cost-benefit, and analysis techniques is desirable. Salary £1,420 to £2,520 a year plus 25% tax-free gratuity. A supplement of £100 a year is also payable direct to an officer's bank account outside Malawi and Rhodesia. 2–3 year contract.

Soil Surveyor

RC 213/134/04

Duties: To set up a soil survey section in the Department of Agriculture to undertake surveys for development projects and later to train Malawian graduates to take full responsibility.

Qualifications and terms: Candidates must be qualified agriculturists with appropriate postgraduate experience. Salary £1,485—£2,600 a year plus tax-free gratuity. A supplement of £100 a year is also payable to an officer's bank account outside Malawi and Rhodesia. 2–3 year contract.

Agricultural Economist

RC 213/134/014

Duties: To work as a member of a British Investigation Team on analysing the existing and planned feeder road network system; to determine its usefulness to the requirements of present and future agricultural production, population, density and growth, and future patterns of economic and social development.

Qualifications and terms: Candidates must have a degree in Agricultural Economics with suitable postgraduate experience.

Salary negotiable. Subsistance and outfit allowance. 3–4 months contract.

If you wish to apply for any of these appointments, or you are interested generally in an appointment overseas, please write giving your full name, age and brief particulars of your professional qualifications and experience to the:

Appointments Officer
MINISTRY OF OVERSEAS DEVELOPMENT
Room 324a, Eland House, Stag Place,
London, S.W.1.

MINISTRY OF OVERSEAS DEVELOPMENT